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HOOKWORM ANAEMIA.

AN OUTLINE IN BASIC OF PRESENT KNOWLEDGE AND OPINION.*

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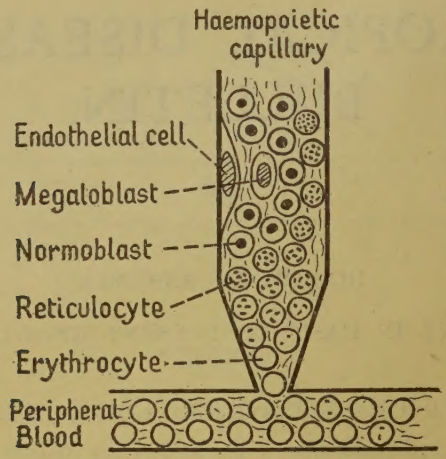
Hookworm anaemia is not a disease by itself, not a thing separate from all other anaemias, and as long as it is so viewed clear knowledge of it will not be possible. Being an anaemia it has something in common with all anaemias, being a microcytic hypochromic anaemia it will probably have most in common with other anaemias of this sort; so it seems wise to take the investigation of its cause in this order—firstly a short account of the structure and working of the erythron, secondly some examples of other anaemias which are seeming pointers to the way in which hookworm anaemia is caused, and thirdly, some account, with my notes on them, of certain important investigations into hookworm anaemia itself. But before doing so this has to be said. Seeing that in some countries most persons have hookworm infection, and that this infection does not keep off other diseases but has quite the opposite effect, there may be other sorts of anaemia from other causes in those harbouring these worms. This does not make the value of what will be said here any less, though it does make it very necessary to be as certain as possible that any anaemia present in a person with hookworms has been caused by them.

The erythron and haemopoiesis.—The erythron is the name given by BOYCOTT (1929) to the red cells in the blood and to that series of cells in the bone marrow from which they take origin. The size of the marrow is possibly 1,400 c.cm. and of the blood in the blood vessels 4,000 to 8,000 c.cm., so that without plasma the size of the erythron may be taken as not less than 2,500 c.cm. (WITTS, 1932).† All the erythron is inside blood vessels. One blood sinus of the bone marrow

* The framework of this paper is in Basic English. But for some special medical words, most of which are judged by the writer to be international, no words are used other than the 850 words of the everyday Basic List and the hundred words of the General Science List.

† Most of this part of this note is based on these Goulstonian Lectures and on Janet Vaughan's *The Anaemias* (1934).

is joined to another by capillaries, by division of whose endothelial cells the great megaloblasts are formed with poorly colouring nuclei (Fig. 1).



Schematic diagram of the erythron.

Fig. 1.

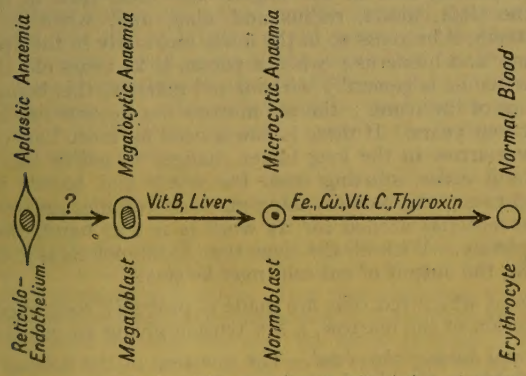
[Reproduced from the *Lancet.*]

From the megaloblasts comes a series of erythroblasts whose nuclei when division goes on take the basic colouring more and more deeply. At last their size is little greater than a red corpuscle and their cytoplasm, at first somewhat basophil (basophil normoblast), in time takes more of the eosin colouring which gives it a " pale violet to pink purple colour " (polychromatic normoblast) and then a " pure pink " (the ripe or orthochromatic normoblast). In the end the erythroblast becomes an erythrocyte by loss of its nucleus.

But in the young erythrocyte bits of the basic-colouring cytoplasm of the basophil erythroblast are still present, and come to light with " vital staining " as a network or reticulum, from which fact the cell gets its name of reticulocyte.

Before any cell of this series is able to undergo development it has to take up into itself a special substance coming to the body with the food, a different one for every stage (Fig. 2). There is little knowledge of that needed for the change from reticulo-endothelium to megaloblast. For that from megaloblast to erythroblast, the substance for special note here, the " haemopoietic factor " of Castle, comes to the marrow from the liver, and though stored in the liver it is made in the stomach, seemingly in this way. An enzyme, named haemopoietin or " intrinsic factor," is normally present in the secretion of the stomach ; it comes into operation there with some substance in protein food, named " extrinsic factor," to make the " haemopoietic factor." This last gets into the body at any point in the wall of the small intestine, after which it is stored in the liver till the marrow has need of it. For the change from erythroblast to erythrocyte the substance, needing special note here, is iron. " Iron is taken up by the nuclei of erythroblasts which elaborate haemoglobin from it and are extruded from the

ripening cell when their task is completed." (WITTS, 1936.) As noted earlier, the iron normally comes to man in food, but the amount in which it is present there is no necessary measure of its value for blood-making—for these reasons. Before its use in the body is possible it has to be put into, and kept in, solution by the operation of the hydrochloric acid (HCl) in the stomach's secretion. But only about half the iron in food seems to go into solution in this way, that is to say only that part which is in, or may readily be made to take up, a simple form; and haemin compounds are not in this part. Again, only about half the iron which has gone into solution is taken up into the body and so becomes of possible use in the making of red cells. But though so much acid is formed in the stomach that the reaction through all the small intestine is acid, most of the iron is in fact taken up into the body in the duodenum and is then stored in the liver and other parts of the body. In other words, before it is possible for there to be normal blood making (haemopoiesis) it is necessary for there to be in the secretion of the stomach "haemopoietin" and hydrochloric acid and, in the food, a protein and iron in a somewhat simple form, for "haemopoietic factor" to be stored in the liver, and for carriage of it and of iron to the bone marrow to take place as necessary.



Scheme of anhæmopoietic anæmias showing point of action of the substances essential for blood formation.

Fig. 2.

[Reproduced from the *Lancet*.]

After an erythrocyte has been formed it has an existence of about thirty days and is then "threshed to bits." The first sign of its coming end is an outcurving of some part of its edge, a change in outline, which gives it the name of poikilocyte. When this outcurving has been broken off from the cell, this is left by so much the smaller (microcyte), and the broken bit is taken up by, and undergoes digestion in, the reticulo-endothelial system, bilirubin and iron being end results of this process. Normally the greater part of these two substances is made use of again and again for the forming of new red cells, the iron being stored till needed in the liver and other organs.

But this roundabout does not go on without waste of iron. In a man, the mean loss is about 1 mg. a day. In a woman with a normal loss every month of about 4 oz. of blood (or 50 mg. of iron) a mean iron

intake of 11 mg. a day is not enough to keep the balance level; the mean demands of pregnancy are 3·2 mg. of iron a day; after the baby's birth the mean loss of iron to the mother in her milk is 1–1·5 mg. a day.*

But this waste, or any other draining of iron, will not necessarily have an effect on the output of red cells by the bone marrow. Even when, for a time, less iron is coming into the body than is going out of it, the marrow will get its needed supply from the body's stores of iron, as long as there are any. Again, when there is an increased loss of iron, and at the same time an equal or greater amount is taken in, the bone marrow will still have enough of it to do its work of making red cells. Lastly, when the two supplies together are no longer enough for the needs of the marrow, haemopoiesis no longer goes on normally, and it is well to keep clearly in mind the reason for this, true at least in general. It is not because there has been damage to the machine—that is in good order—but because the material necessary for the output of good work simply is not there.

The amount of haemopoiesis taking place at any time in the marrow may generally be measured by the amount of red marrow in the long bones. At birth all marrow in all bones is red; with increasing age it becomes yellow, first in the fingers and toes, then in the lower ends of the tibia, fibula, radius and ulna, and, when completely yellow in them, it becomes so in the lower and lastly in the upper ends of the femur and humerus; when a person is 24 years old the upper part of the femur is generally without red marrow, this being limited to the bones of the trunk; the red marrow has become much smaller in the last four years. If there is now a need for more blood making, the yellow marrow in the long bones changes to red in the opposite direction and order, starting from the trunk and ending with the fingers and toes; the blood making machine becomes greater in size. But if the material needed for its work is not at hand, this is not done completely. With all the signs that haemopoiesis is going on in the marrow, the output of red cells may be small.

The rate at which red cells are made is probably controlled by the oxygen tension of the marrow, a low tension giving an increased rate.

The normal haemoglobin level.—The question of the normal amount of haemoglobin in the blood was gone into in the pages of the *Lancet* in 1929 and 1931. About thirty years earlier HALDANE and Lorraine SMITH, from investigations of 24 healthy men, made the discovery that every 100 c.cm. of blood was able to take up 18·5 c.cm. of oxygen; in other words that this quantity of normal blood had in it 13·8 g. of haemoglobin. So they took this point as 100 on the scale of their haemoglobinometer. Their normal figure for women was 91. The makers of other instruments have other normals. "It is not generally known that the Sahli instrument accepts 17·2 g. of haemoglobin per 100 c.cm. of blood as 100 per cent., the Newcomer standard is 16·92 g., whereas the Tallquist scale is set on a basis of 15·8 g. This wide variation in the accepted standard is merely a reflection of the inaccurate basis on which these figures have been calculated" (Dyke, 1929).†

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* The need of an older boy or girl for iron is greater than that of a man.

† The British Standards Institution which is at work on the haemocytometer is turning its attention to the haemoglobinometer.

HOLIDAY, KERRIDGE and SMITH (1935) have gone into the question of the amount of haemoglobin in the blood, pointing out that there are difficulties in the use of colour as a test, that the use of dry haemoglobin weight is not at present a safe base for comparison, that there seem to be two forms of haemoglobin in blood and so it may not rightly be taken as certain that their chemical reactions are the same, that the photo-electric measuring of light which has gone through haemoglobin solutions and of iron are good and that "modern methods of measuring extinction co-efficient are accurate to within 2 per cent." Their belief is that the normal is so different in different places that it will have to be fixed separately for every place. In other words it is not at present possible to have a common measure with readily fixed "standards." But much knowledge may be got without this, if note is made of the instrument used. Thus PRICE JONES in 1931 made tests on 100 healthy men and 100 healthy women in England by the Haldane instrument and his mean haemoglobin in men was 105·4 and in women 98·3. He took the same haemoglobinometer to Boston (U.S.A.) and got with it a mean haemoglobin value in 20 men of 112·25, while DILL in the same men, using the van Slyke method, got 111·8, and WRIGHT using the Haldane instrument got 109·2. On this the *Lancet's* hope (1931) was that the 100 level on the Haldane instrument would not be changed, because the only thing needed was the knowledge of the power of the blood for the carriage of oxygen; and it made the point that, in Buenos Aires, Orias had mean haemoglobin figures of 103 for soldiers, 111 for students and 97 for women. In 43 healthy Indians, teaching in the Calcutta School of Tropical Medicine, the mean figure to the Hellige instrument was 105·9 (NAPIER, 1934).

Making use of the method of Osgood and Haskins in Portland, Oregon, OSGOOD (1935) got a mean haemoglobin, in seemingly healthy persons fourteen years old and over, of 115 (100 to 130) among 259 males, and of 100 (85 to 115) among 152 females: and by the Haldane instrument MCGEORGE (1936) had a mean of 110 per cent. (94 to 125) in 50 medical students in London. It is then clear that the point 100 on the Haldane instrument is not high enough to be taken as the normal haemoglobin level for men, and that the blood of these, if they have anaemia caused by hookworms, has to be lifted not to but over 100 before they may rightly be grouped as healthy. Unhappily not enough attention is being given to these observations.

Two other Anaemias.

Hypochromic anaemia of pregnancy.—In investigations by DAVIES and SHELLEY (1934) on this, the commonest, anaemia of pregnancy, the bloods of all babies at birth had a full amount of haemoglobin and red cells, but five of six mothers had haemoglobin of 41 to 66, in only one of these was the secretion of the stomach normally acid, the food of two was said to be good, of four to be poor. The worst case of anaemia with haemoglobin of 41 gave birth before full time to two babies whose haemoglobin values were 150 and 148. There were other conditions which may probably have been the cause of poor blood-making in five of six anaemic mothers, but the point to which it is desired to give weight here is that the iron stores of every mother were clearly so used up by her baby that there was not enough iron for the needs of the mother herself. From the point of view of biology the foetus is in fact a parasite, getting food and safe keeping from its mother and causing

in her a loss of iron so great that it has, in certain conditions, a serious effect upon her well being.

Poor food as a possible cause of anaemia.—The condition of being without enough good food, and specially food with much iron, is so common in the tropics among those groups in which hookworm infection is greatest, that it is most difficult, in fact generally impossible, to say what bad effects may be caused in these persons by wrong food and what by hookworms. Happily observations on poor food as a possible cause of anaemia have been made in places where there is no hookworm and, as will be seen later (p. 10), on those with hookworms whose food is good in amount and quality.

Tests on persons taking food poor in iron were made in Aberdeenshire by DAVIDSON *et al.* (1933). In 115 families taken from among the poorest, every person had a mean intake of 11 mg. of iron a day, and a number of them were healthy with normal blood even when their iron intake was 6 mg. a day. "In short," these writers say, "provided no demands for additional iron were present . . . no person was found to be taking a diet so poor in iron that an anaemia could be attributed to direct iron deficiency." In point of fact, there were two groups among them, 795 men and young persons between 5 and 14 years old, and 455 women ; in the first group there was almost no anaemia, but almost half the women had it ; so it is clear that the chief cause of their anaemia was the draining away of iron in one or more of three ways—in the loss of blood every month, in the building up of the foetus, and in the milk. It was not caused by an intake of iron less than that necessary for the normal needs of the body, if the iron losses of women caused by sex are put on one side ; it was caused by the greater loss of iron which comes about by reason of sex. Putting first things first, loss of iron from the body was the cause of the anaemia which these Scottish women had ; their food made it hard for them to take in enough iron for the loss to be overcome ; but the overcoming of the loss came second, the loss itself came first.

The Cause of Hookworm Anaemia.

In these two examples, anaemia has come into being because of an increased loss of iron caused by physiological parasitism or by loss of blood, the machine itself—the metabolism—being in good working order. If in hookworm anaemia the machine is in good order, then the balance of metabolism in the bone marrow is wrong. On which side is the true error ; is it on that of iron intake in the food and of such iron stores as there are in the body, or on that of iron loss caused by the worms ? If in the treatment and in the prevention of hookworm anaemia we are to put first things first, we have to be very certain of the right answer to this question.

As was pointed out by FÜLLEBORN and KIKUTH (1929) there has been much doubt as to how hookworm anaemia is caused. Suggestions have been—loss of blood, toxins which may do damage to red cells or to the marrow which makes them, and wrong metabolism. After discussion of these points themselves, there will be an attempt to make the position clear by examples from certain papers with the addition of my views on them.

Loss of blood.—That loss of blood is certainly caused by hookworms was made clear enough by WELLS (1931) even to those who had taken up the position that they had seen no blood in worms which were taken from the intestine of a dead host. We have knowledge that blood is

kept in the worm's intestine for a short time only, and Wells, using *A. caninum* and a special box placed in the open small intestine of a dog, made a comparison between the number of red cells which came away from a worm's anus and those in the same dog's blood. If there is no solution of red cells, no haemolysis, in the hookworm's intestine, every worm took a mean amount of 0·84 c.cm. of blood from the dog every day; but if there is such haemolysis this amount is not great enough. NISHI in like tests (1933) put the loss to the host as 0·7 c.cm. of blood for every worm harboured. FÜLLEBORN and KIKUTH gave an account of a dog with 1,100 *A. caninum*, its bowels had not been open for three days before its death and in them were 46·5 mg. of iron; this amount would be present in 456 c.cm. of the poor blood it had in its vessels three days before its death, the day on which its bowels were last open; every worm had then been the cause of a mean loss of at least 0·14 c.cm. of blood every day. Because the normal habitat of the worm is at a lower level than the duodenum, and because haemin compounds do not go into solution in any acid secretion which may get lower down the intestine, it is probably true that the amount of iron inside this dog's intestine was very near to that which had been taken as blood from its walls. Again, because *A. caninum* and *A. duodenale* are so alike in structure and size, what is true for the one may generally be taken as true for the other.

ASHFORD, PAYNE and PAYNE (1933, a, b) gave details of six persons whose infections with *A. duodenale* were got while sea-bathing. The worms which came away from them after anthelmintics numbered from 21 to 1,439. Five of the six had seen blood in their faeces; the sixth, a woman with 21 worms, had not seen any. "That there was blood in every case was later verified by microscope or chemical examination" (1933 a). More delicate tests, expertly made, gave a different answer from that of a simple test by a simple person. There was in fact an unmeasured loss of blood from all these persons, and a development in all of them of an anaemia with lowest haemoglobin levels between 17 and 67, it being 33 in the woman from whom only twenty-one worms were seen to come away.

In the same way in WHYTE's tests (1916) there was blood in the faeces when less than 20 worms came away later after anthelmintic treatment; there had been in the food of these persons no meat or blood for three days before the test, which was made with phenolphthalein and hydrogen peroxide.

Is this loss of blood a good enough explanation of the anaemia? In DE LANGEN's view (1933) it is not—for these reasons: In most, but not all, of his cases chemical tests of blood in the faeces gave a reaction as strong as that got when 2 to 3 c.cm of blood were taken by mouth, while after the driving out of the worms there was little or no reaction to the tests; from a sheep whose blood volume was put at about 3,500 c.cm., there were taken every week for four years 100 c.cm. of blood, and at the end of that time the animal was in first-rate condition with a normal blood picture. But it is not possible to give agreement to this reasoning. As to man, FÜLLEBORN and KIKUTH's experience of different tests for blood in faeces makes clear their different values; the effects of benzidine were so poor that they gave up its use, while in tests with guaiacum there was less error than in those with pyramidon. The sort of test used is very important, but DE LANGEN does not say which was his selection, so one has no idea of the value of decisions based on them. In addition he gives no reason for his belief that unworming

has really been effected, and most tests give no certain answer on this point even for female hookworms. He does not take into account the iron in the food or stored in the body; food and such stores were possibly (were they not certainly ?) enough for all the blood making purposes of the sheep's bone marrow. His reasons against the view that loss of blood is great enough to be the cause of hookworm anaemia are judged not to be good ones.

There has been doubt as to the relation of these facts to hookworm infection generally, in part because blood is not seen in the faeces of every person with hookworms and in part because some of these cases have been so "acute." The limits of value of tests for blood in faeces have been noted, but of the degree of their error there seems little knowledge. As to this point being dependent in any way on the time for which infection has been present, Wells's dogs seem to have had theirs for some time, but even if they had not, the physiological process which he saw in the worm was so clear, and the motion of the oesophagus so special in act and rhythm, that it would be unwise to put forward without proof any suggestion of its being a behaviour which is not at all times normal to the worm; and if this motion is the same in new and old infections the effects on the wall of the bowel will be the same, that is to say there will be loss of blood from the wall of the intestine whenever the worms are taking food.

In controlled tests, then, in dogs and men there have gone together hookworm infection, loss of blood from the intestine, and anaemia. Loss of blood day by day (which is one of the certain causes of microcytic hypochromic anaemia) has then to be taken into account as a cause of the microcytic hypochromic anaemia for which hookworms are responsible.

Toxins.—In the view of Fülleborn and Kikuth, anaemia might be caused by toxins in one of two ways, through destruction of red cells or through damage to the blood making organs. As to destruction of cells, they got no proof that a haemolysin was present, because though there was a process of this sort in the test tube there was no such process in the living mouse, *Mus musculus*, and there was no iron in the livers of dogs with large infections, a place where it would have been stored if haemolysis were going on.* The resistance of red cells was normal, and no anaemia was caused by injection into mice of the serum of anaemic dogs, or by giving them as food living or dry dog hookworms. There was no discovery of toxin here; but the irritation present in "creeping eruption" is necessarily, in their belief, caused by a poison given out by the larvae. But this view is safe only if no bacteria were present in the liquid round the larvae, and on that point nothing is said by these workers. There are then no facts on which may safely be based any suggestion that toxins are a cause of hookworm anaemia.

Wrong metabolism.—The suggestion of such wording may be that the machine is working badly or that it has not enough of the right material for blood making. Of the first we seem to have little knowledge. How common the second is has been made clear, so that in that sense all blood making in the marrow is a question of metabolism. If the need for this is the result of blood loss, the way in which the loss has come about is unimportant from the viewpoint of the metabolism which has to put it right. It may for example have been caused by the

* de Langen (1933) and Cruz (1933) are in agreement that there is nothing to support haemolysis.

act of a parasite or by a badly done bit of cut-throat work, but in whatever way it comes about much will commonly have to be done before the doctor who puts first things first is able, with a quiet mind, to give any thought to helping metabolism by his line of treatment.

The position is that in hookworm infection there is a loss of blood, and so of iron, and that it is caused by the hookworms. Before the marrow is able to make more red cells, it has to have iron. It may get it from the food or from the body's stores, which in turn came from the food. If in one way or the other it does not get enough iron for its purpose the red cells which it makes are not made rightly, but there is no proof of any error in the machine itself caused by poison or in any other way. More light on this question will be got in that discussion of certain papers which is now taken up, with the addition to it of my views on their value based on my reading of present knowledge on the process of blood making.

Effects of Treatment as Pointers to the Cause of Hookworm Anaemia.

The purpose of treatment in hookworm anaemia is to get the haemoglobin to the normal level of over 100 for men by the Haldane instrument or seemingly by any other. It is hoped that the examples now to be given will make clear how generally this is not being done.

Twenty-five years ago ASHFORD and GUTIERREZ IGARAVIDEZ (1911, p. 136) put into these words their experience of treatment of many tens of thousands of persons in Porto Rico. "The object of treatment is, of course, to remove the cause by expulsion of the parasites. In many light and moderate cases this will suffice, but in old chronic cases and in those where the disease has reached a severe grade some regenerative treatment should follow the specific." And again (p. 135) "Each person who harbours this parasite, whether suffering from anemia or not, is a focus of infection for others; hence the reduction of these foci becomes an important prophylactic measure." In the view then of these writers unworming is a completely necessary first step in the treatment and prevention of hookworm anaemia, equally in the interests of the harbourers of worms and of those living near them; and after unworming the anaemia will generally get better of itself. In the light of what has gone before it is judged that the iron in the food and body stores of these Porto Ricans was generally enough to let the bone marrow do its work rightly. To those in whom it was not enough more iron has to be given.

Oswaldo CRUZ (1934a) puts the position as he sees it in these words. "The results presented show that the primordial factor in the genesis of Intertropical Hypohaemia, afterwards denominated Ankylostomiasis, lies in a dietary deficiency which produces an iron deficiency in the organism, thus conveying an anaemia which in its turn determines the main symptoms of the disease. Although the helminth is imputed as the single etiologic agent of ankylostomiasis, the direct action of the parasite, in the genesis of anaemia, is of very slight effects, always fairly less consequential than those due to the preponderant action of alimentary deficiency." This goes into Basic in some such words as these. Putting first things first, though the hookworm has been put first by others it has little effect in the causing of hookworm anaemia; it is food poor in iron which is the true cause.

In support of his statement CRUZ gave details of five persons who were not unwormed but had long treatment with iron, up to almost nine

months. With this they had increases of haemoglobin from 13 to 81, 20 to 74, 16 to 82, 23 to 76 and 30 to 94. Again (1934, b) he gave like treatment to twenty-five persons; before treatment their haemoglobin values were between 10 and 40 and after it between 62 and 91 (mean 77). Even with this long treatment CRUZ was quite unable, as long as hookworms were harboured, to get the haemoglobin back to the normal for Brazil. In most cases it was a long way under this level; he did not give proof of his statement that the worms are unimportant in the causing of hookworm anaemia. His facts take one in the opposite direction. Later (1934, c) he gave ten persons anthelmintics but no iron. The mean values of their haemoglobin before, and again after, this seeming unworming were 22 and 23 for the lowest figures and 38 and 75 for the highest. Two points have to be made here. I see in his paper no proof that these persons were unwormed. Even if they were the tests were not rightly controlled. In the making of controls it is completely necessary to undertake two series of parallel tests which are different, one from the other, only in one detail (LANE, 1927). The right way here would have been to give iron to all persons in the two series while making as certain as possible of the complete unworming of those in one series, and giving no anthelmintic treatment at all to those in the other; in place of this, comparison was made between those with iron and with worms on one side and those without iron and, it was hoped, without worms on the other. The tests were not rightly controlled and have no solid value, though the facts are an addition to our present knowledge that it is hard for marrow to make the blood normal as long as the body is being drained of iron by hookworms.

The same point came out in the investigations of ASHFORD, PAYNE and PAYNE (1933, a, b). Though given an anthelmintic from two to nine times (mean 5·2), 13 being with hexylresorcinol and 20 with carbon tetrachloride, not one of the seven persons in question was unwormed, and after taking iron freely and being kept under observation for a year they had in the end haemoglobin values between 74 and 80 (mean 76)—and they were well-off people taking good food. Once more the marrow was unable to make the blood normal, this time in persons who were taking good food, but whose iron stores had clearly been drained and who were still harbouring worms. Here is another pointer to the need for unworming if first things are to be put first in the treatment of hookworm anaemia.

In my view the same decision has to be made on the work done by RHOADS, CASTLE, PAYNE and LAWSON (1934, a, b), in whose opinion hookworm anaemia is caused by loss of blood going on for long, and by nothing else. Because the giving of 6 g. of iron and ammonium citrate a day "*with or without the removal of parasites*"* made the blood values and the clinical condition far better, they have made a point of "the practical importance of directing therapy first against the anemia in hookworm disease and secondly against the parasite." In an investigation whose purpose is the discovery of the effects of iron in those who are still, as against those who are no longer, harbouring hookworms, the first thing necessary is to be as certain as possible that those under investigation have been put into their right groups. The writers have not done this. By "direct examination," probably a "smear," they saw hookworm eggs in the faeces at the start, and as to unworming they let themselves be dependent

* So printed in their paper.

on hexylresorcinol, as being an "efficient anthelmintic," and for this last statement they take as their authority the work of LAMSON, BROWN, ROBINS and WARD (1931). But in the work under Lamson the number of persons who were still harbouring hookworms after treatment with 1 g. or more of hexylresorcinol given in water was 46 per cent. and if the rough methods of diagnosis which were used in this last investigation before treatment were used again after it, the number of those still harbouring worms after treatment was undoubtedly higher, possibly much higher; so one has no right at all to the opinion that in the work headed by Rhoads now under discussion the conditions were any different. That being so, Rhoads did not in fact put into different groups those who had been unwormed and those who had not; in work of the same sort on animals the attempt to do so is being made with greater care on this point, and in work on man it is at least as necessary to make use for this purpose of the best methods of which we have knowledge. These writers say "It is also not intended to imply that because anemia can be totally relieved by the exhibition of iron without removing the parasites, the latter play no part in its production." In point of fact anaemia was not "totally relieved" by iron in any worm-harbouring person of whom they give details. For example in their Table 4 there are twelve persons who had treatment with 6 g. of ferric ammonium citrate a day for fifty days and who had had no hexylresorcinol; their mean haemoglobin after this treatment was only 68 (52 to 78) and no better results are seen in their other Tables. As has been pointed out, the normal haemoglobin value for healthy men is over 100 in all parts of the earth where it has been tested, so that the anaemia of these persons was far from being "totally relieved." A comparison with the results in the case of those who had been given hexylresorcinol is not any value as a control, because there is no proof that unworming took place in them. Rhoads and his group were not then able, by treatment with iron, to get the blood to normal in any person who was harbouring hookworms, in fact the mean figures were a long way under that level; there is good reason for saying that it was probably for the same cause that they were unable to get haemoglobin up to normal in those who had had hexylresorcinol—most of them were still harbourers of worms; but, after all, true decisions on this question will not be possible as long as use is not made of those methods of diagnosis which have the smallest error. Again these writers had in mind the testing of "the effect of only *one procedure at a time.*"* Unhappily they did not put this into effect, because they made, in fact, no good division between those still harbouring and those no longer harbouring worms. Again, they say "Since the presence of worms without anemia is not necessarily detrimental to health, it should be possible to employ iron salts as a prophylactic, either alone or preferably in combination with anthelmintics." But to what degree are hookworms present in man without causing anaemia? FOSTER and LANDSBERG (1934) have put on record with surprise that this may be so in some dogs, but they give no details as to the amount of iron in their food, or in their bodies after death, and if these amounts were enough for the needs of the marrow there is no reason for anaemia to come about (seeing that toxins have no hand in its cause) than there would be in de Langen's sheep. As to man, RHOADS and his group possibly had in mind the work of SMILLIE and AUGUSTINE (1925, 1926),

* So printed in their paper.

but this was put through by methods by which small infections do not come to light, and again the mean haemoglobin value in persons judged by them to be free from infection was only 78 (LANE, 1932, fig. 29); these are not facts in proof of the belief that hookworms may frequently, or even sometimes, be present without being the cause of anaemia in man, and there seem to be no others which are seriously based on fact. However this may be, in the experience of the Rhoads group of workers, no person harbouring worms ever had normal haemoglobin. As to prevention, their suggestion is that this may rightly be limited to the treatment of one symptom of a disease, while doing nothing to put a stop to the distribution of hookworm eggs; so that the person with infection is, in the conditions present among hundreds of millions between the 24th parallels, a danger to himself and to those living near him. As facts make clear, this line of prophylaxis is of very little use against anaemia and of none at all in keeping others from getting infection.

It is hard to put a value on the work in Egypt of BIGGAM and GHALIOUNGUI (1934). Diagnosis was by an unnamed floatation method but quite frequently great numbers of ancylostomes came away under treatment when no eggs had been seen in the faeces; and their paper makes no note of the possible harbouring of schistosomes as a cause of anaemia. After iron treatment the mean haemoglobin was never as high as 80, and in most cases was less than 70.

Pathology as a Pointer to the Cause of Hookworm Anaemia.

PEÑA CHAVARRIA and ROTTER (1935) made an investigation into the matter in Costa Rica and gave details of 96 important necropsies. When death was caused by hookworms, there were no iron stores in the body, while in those in which there had been anaemias of other sorts and who had been taking the same food, iron stores were present; they are quite certain that use may be made of this fact in separating one group from the other. Again most of these persons came from the Canton of Costa Rica, and in it less meat is taken than in any other Canton in the State. Taking them all together the marrow of the femur was red in 42 per cent., half or more of it in 36 per cent., and less than half of it in 21 per cent. Once more the only good explanation seems to be that there was first of all a loss of blood caused by the hookworm, something outside the normal waste of the body. And as, in Aberdeenshire, women taking poor food were not able to make good from it the iron losses normal to their sex (in which the needs of that biological parasite, the foetus, have an important place), so those harbouring hookworms in Costa Rica were not able to get from their food enough iron to take the place of those iron losses caused by the parasites; the outcome being that the iron stores of the body become used up in them, but not in those with anaemias which are not caused by a blood-taking worm, but who had the same food. With its stores of iron gone and not enough of it in the food for normal blood making, the marrow did overtime, as one might say, but the erythroblasts were not able to get the right material for the normal making of the erythrocytes and the output of these was far from being enough. In this chain of events the loss of iron from the body was the first thing, the need to put it back came second; and first things have to be kept first.

The Outcome of the Discussion.

Hookworms take blood, and so iron, from those who are harbouring them, and this is the first step on the road to hookworm anaemia; this

loss has to be overcome by giving to the blood-making marrow iron from the food or from stores in the body, and this is the second step. When this loss has gone so far that serious anaemia is present, and when iron has then been given without unworming, the anaemia has become less ; but in this outline, which in my hope and belief has given an account of all papers which have weight here, no example has come to light of a case in which the haemoglobin has become normal under iron treatment so long as worms have still been present in the bowel ; in most the level has been very much under what in our present knowledge is normal. In the treatment of hookworm anaemia the first step has then to be the same as for hookworm infection, that is unworming, the second the putting back of iron into the body. This decision makes it the more important for there to be undertaken as quickly as possible an investigation, with open mind and on the right scale, to make as certain as possible what anthelmintic, new or old, is the best and safest ; seeing that, in the present living conditions unworming is the only way for the prevention of infection, or prevention or overcoming of anaemia, in hundreds of millions of those living between the 24th parallels. A small number of persons with serious anaemia from hookworns may when first seen be so seriously ill that it is unsafe to give them an anthelmintic straight away, and for them the danger of that increase of infection which may be caused by them to themselves and others will have to be put on one side till iron has made them in some degree better ; but that is a very different thing from saying that the treatment of a symptom, and of a symptom only, is normally the right thing to do for the person in question and for those living round him.

Let it be said once more : With almost everyone who is harbouring hookworms his medical man has first to put a stop to the loss of blood and iron which is being caused by the worms, and second to give iron to take the place of that loss ; and this order is equally the right one for the treatment of hookworm anaemia.

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RHOADS, C. P., CASTLE, W. B., PAYNE, G. C. & LAWSON, H. A. (1934 a). Hookworm anemia : etiology and treatment with especial reference to iron. —*Amer. Jl. Hyg.*, **20**, 291. [*T.D.B.*, 1935, Vol. 32, p. 263.]

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HELMINTHIASIS.

CULBERTSON (James T.). **The Cercaricidal Action of Normal Serums.**—*Jl. Parasitology.* 1936. Apr. Vol. 22. No. 2. pp. 111–125. [15 refs.]

Cercariae die quickly in the sera of certain animals. The paper gives details of experiments which make this clear, with a discussion of the chemical body which is the cause of their death.

The sera of man, white rat, and cat, of the domesticated duck and herring gull, of water snake and green frog, and of the bull-head fish have been tested against a number of species of cercariae. Only the cat's serum was inactive to all. There was no proof that the age of the cercaria influenced the effect. A batch of cercariae from one snail may be killed much more readily than a batch from another snail of the same species using the same serum. If the serum is kept at 56°C. for 15 minutes or more the death rate among cercariae is the same as in normal saline, and after storage for 4 days there is no lethal effect on them, nor is there when serum has been mixed with dried cercariae or dried typhoid bacilli. But alexin is inactivated by a temperature of 56°C. Is it then alexin which is cercaricidal? No; for cat's serum contains alexin but is not cercaricidal. On the other hand the cercaria of *Schistosomatium douthitti* is not killed by duck serum, but this parasite is not infective for ducks. [There is then raised once more the question whether the well-known restriction of parasites in host and habitat is due to something in these hosts or habitats which is for them a poison, or to the lack there of something necessary for their special metabolism.] *Clayton Lane.*

KOMIYA (Yoshitaka). **Study on *Clonorchis sinensis* in the District of Shanghai. 2. On the Habit of eating Fresh Water Fish among the Japanese in Shanghai.**—Reprinted from *Jl. Shanghai Sci. Inst.* 1936. Mar. Sect. IV. Vol. 2. pp. 61–73. [13 refs.]

The Japanese have the highest percentage of infection with Clonorchis among the races living in Shanghai.

Of 2,295 Japanese families questioned, 44·31 per cent. had a taste for fresh water fish and most of them liked it best raw, and ate it so all the year round. Naturally the children take after the parents, and as the Japanese make use of no river water for drinking or washing dishes the source of their infection is clear. *C. L.*

KAWANA (Hiroshi). **Study on *Clonorchis sinensis* in the District of Shanghai. 3. Dogs, Cats and Rats as Reservoir Hosts of *Clonorchis*.**—Reprinted from *Jl. Shanghai Sci. Inst.* 1936. Mar. Sect. IV. Vol. 2. pp. 75–84. [24 refs.]

In 228 " field " dogs 36·62 per cent. were infected, of 15 house dogs none. This is probably because the former are scavengers or are fed with raw false dace or bitterling, small fish which are not eaten raw here by man. In 202 cats there were 57·92 per cent. infected (adults 69·37 per cent., young 14·28 per cent.). The mean weight of infection showed the same tendency, 195 flukes in cats and 26 in dogs. *C. L.*

KOMIYA (Yoshitaka) & KAWANA (Hiroshi). **Study on *Clonorchis sinensis* in the District of Shanghai. 4. The Second Intermediate Hosts of Clonorchis.**—Reprinted from *Jl. Shanghai Sci. Inst.* 1936. May. Sect. IV. Vol. 2. pp. 155–167. With 3 plates. [18 refs.]

"The writer made feeding experiments with 15 species of fresh-water fish ordinarily obtained from the market upon guineapigs, rabbits and young dogs and found 10 of them were the actual second intermediate host of *Clonorchis*. And among these 10 species three of them, namely *Culter alburnus* Basilewsky, *Parapelecus argenteus* Günther and *Elopichthys bambusa* (Richardson) have not been recorded as yet as the second intermediate hosts of *Clonorchis*.

"A brief description was made concerning these three species of fish."

There are in addition a list of 43 second larval hosts and illustrations of the 3 new ones. *C. L.*

KAWAI (T.) & YUMOTO (Y.). **On the Distribution of the Encysted Cercariae of *Clonorchis sinensis* (Cobbold) in the Second Intermediate Host, *Pseudorasbora parva* (Temminck and Schlegel), and the Rate of their Infections to the Mammalian Hosts.**—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1936. Apr. Vol. 35. No. 4 (373). [In Japanese pp. 880–887. [28 refs.] English summary p. 887.]

About half the cysts were in muscle, and 58 per cent. of them gave infection to cats after the fish had been 5 to 10 days in ice. *C. L.*

GALLIARD (Henri), PHAN-HUY-QUAT & DANG-VAN-NGU. Le troisième cas de distomatose pancréatique à *Clonorchis sinensis* observé au Tonkin.—*Bull. Soc. Méd.-Chirurg. Indochine.* 1936. Apr. Vol. 14. No. 4. pp. 379–383. [18 refs.]

GALLIARD (H.), AUTRET (M.) & PHAN-HUY-QUAT. Recherches sur l'insuffisance hépatique dans la distomatose à *Clonorchis sinensis* au Tonkin.—*Bull. Soc. Méd.-Chirurg. Indochine.* 1936. May. Vol. 14. No. 5. pp. 444–447.

GALLIARD (Henri). Un nouveau cas distomatose pancréatique à *Clonorchis sinensis*. [*Clonorchis sinensis* **in the Pancreas.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1936. May. Vol. 14. No. 5. pp. 442–443.

The fourth case from Tonking. *C. L.*

VOGEL (Hans.). Beobachtungen ueber Fasciolopsisinfektion. [**Observations of Fasciolopsis Infestation.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. May. Vol. 40. No. 5. pp. 181–187. With 5 figs.

Observations on the carriage of *F. buski* in Hsiao-shan in the province of Chekiang, China.

It was not found possible to infect in Hamburg *Planorbis schmackeri* and *Segmentina nitidella* brought from China. In an autoinfection 4 cysts were swallowed, 35 days later there was colic, at the end of 6 months the infection disappeared. Eosinophilia was up to 19 per cent. There were no other symptoms. For one adult there were counted 126 eggs per gram of faeces. *C. L.*

WALLACE (F. G.). **A New Intermediate Host of *Fasciolopsis buski* (Lankester) (Trematoda : Fasciolidae).**—*Lingnan Sci. Jl.* (continuation of *Lingnaam Agric. Rev.*). 1936. Vol. 15. No. 1. pp. 125–126.

Cysts having the appearance of those of *F. buski* were found in the small planorbid snail *Segmentina calathus* Benson in the village of Boon Tong on the north-west border of Canton where there is a high incidence of this fluke in man. The percentage of infection in 450 snails was 0·66.

"*Segmentina calathus* is one of the most common planorbid snails in the vicinity of Canton. It is found in shallow ponds and paddy fields devoted to the cultivation of aquatic plants where it may be found floating on the surface of the water or adhering to vegetation.

"It is very small, the largest specimens measuring 4·5 mm. in diameter and 2 mm. in height. The shell is rounded on top with the apex sunken and consists of about four whorls. It may be distinguished from the other planorbids which share its habitat by the three radiating internal ridges or teeth on the ventral side of the outer whorl. As far as can be determined from the literature at hand this species which is abundant in parts of India has not been reported previously from Kwangtung."

The snail was identified by PILSBRY. *C. L.*

WANG (M. S.). Ueber die Krankheitserscheinungen bei Infektion mit *Fasciolopsis buski.*—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. June & July. Vol. 40. Nos. 6 & 7. pp. 243–255; 295–301. [37 refs.]

WU (Kuang). Distribution of Paragonimiasis in China. 1. Chekiang Province.—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 442–448. With 1 map.

CHEN (H. T.). **Further Notes on the Life History of Paragonimus from Rats.**—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 368–378. With 10 figs. (5 on 2 plates). [10 refs.]

In a small village, Ue Lok Chuen, adjoining the Campus of the Lingnan University, Canton, *Mus norvegicus* is a common natural host of Paragonimus, a new record. In 100 pigs from Canton slaughter-houses there was no infection. The snail host is *Assiminea lutea* and the crab hosts *Sesarma* (*Sesarma*) *sinensis* and *S.* (*Holometopus*) *dehaani*, the first two being new [they are not illustrated]. The snail is small, amphibious, and was seen in foul water between mulberry beds and attached to stones and plants. Every crab has its own wide hole above water level in which it takes refuge when there is need to do so. *C. L.*

KAU (L. S.) & WU (K.). **Preliminary Report on Histopathology of Paragonimiasis in Cats in China.**—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 101–105. With 6 figs. on 3 plates.

The report deals with the pathological anatomy of the lungs of cats who have this infection.

As the authors note, the slow course of the disease in man brings few patients under qualified doctors, and even if they do come under them autopsies in China are almost impossible to get. So study of the pathology in cats may be valuable. Congestion and oedema with much collapse though with emphysematous edges to the lung are the rule. The degree of fibrosis varies. Cysts may or may not have worms in

them. [In view of conditions now being disclosed in Metagonimus infections in man, it is of interest to note that distorted ova are found embedded not only in the fibrotic walls of the cysts, and in the bronchial mucosa and submucosa, but beneath this and in the sinuses of the lymph nodes at the hilum.] *C. L.*

MILLER (Edwin Lynn). Studies on North American Cercariae.—*Illinois Biol. Monog.* 1936. Vol. 14. No. 2. 125 pp. With 108 figs. on 8 plates. [107 refs.]

GIOVANNOLA (Arnaldo). Inversion in the Periodicity of Emission of Cercariae from their Snail Hosts by Reversal of Light and Darkness.—*Jl. Parasitology.* 1936. June. Vol. 22. No. 3. pp. 292–295. With 3 figs.

CAMPBELL (Horace E.), WEBSTER (John L. A.) & LI (S. Y.). **Human Sparganosis in the Foochow Area.**—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 423–433. With 4 figs. on 1 plate. [18 refs.]

A summary of the subject and a report of 5 new cases, 2 of orbital infection.

"In four cases the history of the application of a freshly killed frog was obtained. The known antiseptic power of spargana suggests its use as a rational therapeutic agent. The custom of applying split and swallowing live frogs is common in the Foochow area. Bizarre lesions should prompt the medical attendant to inquire as to the application of a frog to the diseased site." *C. L.*

THOMPSON (J. E.). **Some Observations on the European Broad Fish Tapeworm** *Diphyllobothrium latum.*—*Jl. Amer. Vet. Med. Assoc.* 1936. July. Vol. 89. No. 1. pp. 77–86. With 4 figs.

The paper deals with infection with the broad tapeworm of fish in Lake Skagawa, Ely, Minnesota, and of man on its shores.

After summarizing the work in the region of the Great Lakes and the anatomy [it is not the ovary which gives a brown spot to the segment of *D. latum*] and life history of the worm, it is pointed out that in 1927 every 4 to 5 pound northern pike taken there would be infected and probably have in it 20 to 40 plerocercoids; now the number of these in a fish would be only one or two. But Shagawa Lake still gets many ova from the sewage of Ely City. In 1926 an Imhoff tank was set up to deal with this sewage. Its effluent was tested by collecting in small quantities a gallon of effluent daily for 20 days; every day an onchosphere was found in 2 daily portions of a litre of this. The tank does not hold back all these eggs and thousands are passing into the lake every day. And the question is asked whether if these faeces were dropped by natural man where he pleased about the country the hazards of topography and the elements would bring it about that fewer would enter the Lake than do so when man has gone to the trouble and expense of sewage disposal. It is pointed out that storm and household drainage run into the same sewers.

"Sanitary engineers have felt for some time that more thorough sewage treatment is needed. They base their opinions as to the efficiency of a sewage plant on the physical, chemical and bacteriological nature of the effluent. Let us hope parasite control will likewise be considered."

The infections in man were almost all among Finns who eat brine-pickled fish or among those who had access to this delicacy. *C. L.*

BERBERIAN (D. A.). **Some Observations on the Effect of Digestive Juices on Scolices of** *Echinococcus granulosus* **(Batsch).**—*Jl. Helminthology.* 1936. Mar. Vol. 14. No. 1. pp. 21–40. With 4 figs. on 1 plate. [32 refs.]

It is suggested that digestive juices play an important part in determining immunity to parasites which at any period of their life cycle make use of the alimentary canal.

In vivo and *in vitro* experiments were put through. Gastric juice of dogs, cats, sheep and cattle did not digest scolices; that of rabbits acts slowly, and of man is incomplete. Intestinal juices of man, rats, rabbits, sheep and cattle digest scolices completely, that of dogs and cats is inactive, but kittens are slightly susceptible to infection. So long as a scolex was contracted it underwent little or no digestion. The conclusion is that animals whose gastric and intestinal juices are capable of the digestion of scolices are safe from infection, the others are not.

[The assumption is that these digestive juices have an action on the scolex while this is still living. The other explanation is that they have such an action only when it is dead, and that the death may be due to the presence or indeed absence of substances or conditions not directly associated with the activity of these juices.] *C. L.*

GENTILE (Gaetano). Recherches expérimentales sur le "Taenia echinococcus." [**Research on** *Taenia echinococcus.*]—*Boll. Sezione Ital. Soc. Internaz. di Microbiologia.* Milan. 1936. May. Vol. 8. No. 5. pp. 106–111.

——. Ricerche sperimentali sulla "Taenia echinococcus."—*Boll. Istituto Sieroterap. Milanese.* 1936. Aug. Vol. 15. No. 8. pp. 508–514. German summary.

MONIEZ' statement that it is the gastric juice which dissolves the shell of the echinococcus ovum and sets free the embryo, and the hypothesis of MARTIN that an alkaline environment is the active agent, are not confirmed by the author in the experiments here described. He first placed in a well-slide the eggs with a drop of pure acetic acid, and in another a drop of ammonia. In a few minutes the shell ruptured and the vitelline substance between it and the embryophore was dispersed over the field, but the embryophore with the embryo remained intact. Even after a longer period up to several days no further change was observed. When a similar experiment was made, substituting xylol for the acid or alkali, the vitelline substance became homogeneous and clear, no longer retaining the normal granular appearance; but the shell was not ruptured and the embryophore and embryo seemed to be unchanged.

The author next carried out analogous observations with gastric juice obtained by a gastric sound from a patient with duodenal ulcer; with bile from a patient operated upon for drainage of the gall-bladder; and with duodenal secretion by duodenal sound. In all cases the shell was destroyed, the vitelline substance became scanty, and the embryo granular. In controls with physiological saline, the shell was not affected, but the embryo gradually assumed a granular appearance similar to that in contact with the secretions. The author is of opinion that these take no actual part in nature in setting free the embryos, the liberation being due to a biological process originating in the embryo itself when it has reached the requisite degree of maturity. *H. H. S.*

PUTZU (F.). L'echinococcosi in Italia. [**Hydatid Disease in Italy.**]—*Riforma Med.* 1936. May 16. Vol. 52. No. 20. pp. 672–676. [2 pages of refs.]

This article has considerable value for purposes of reference, though the actual number of cases analysed is not great. The author has studied the situation in the body of the cysts in 391 cases. The liver, as would be expected, comes first with 210 or 53·7 per cent. ; the pleura is next, but a long way behind, with 65 or 16·6 per cent. and the spleen third with 17 (4·3 per cent.), though the muscles and connective tissues together give 7·6 per cent. He gives a table comparing his percentage findings with those of MADELUNG, PEIPER, NEISSER and DÉVÉ from which it will be seen that though the order is the same, the actual proportions differ considerably. The paper has a full and useful list of references. *H. H. S.*

SABADINI (L.). **Les kystes hydatiques de la rate.**

This book was reviewed in Vol. 33, p. 814.

CHOURAQUI (Roger). Les procédés de destruction des kystes hydatiques dans un but prophylactique. [**Destruction of Hydatid Cysts with a View to Prophylaxis of the Disease.**] [Thesis presented to the Faculty of Medicine, Algiers.]—90 pp. With 4 figs. [Bibliography.] 1935. Algiers : Imprimerie F. Michaud.

The subject of the title is considered in seven pages at the end.

After nine dedications and a world wide historical survey the writer concludes that in Algeria not enough is being done to prevent hydatid infection and that since the worm is undismayed by sea water or sewage, it, as it lies in the viscera, must be boiled in potassium carbonate solution. [As there has to be a fire, why not burn these ?] *C. L.*

BOLOGNESI (Giuseppe). Rottura spontanea di una ciste idatidea epatica nel duodeno. Lezione clinica e ricordi di patologia.—*Riforma Med.* 1936. July 11. Vol. 52. No. 28. pp. 951–957. With 2 figs. [19 refs.]

SEN (Satya Charan). **Development of Adult Taenia Echinococci in a Hydatid Cyst in the Muscle of a Sheep.**—*Calcutta Med. Jl.* 1936. July. Vol. 31. No. 1. pp. 38–40.

This curious report from the Department of Physiology, Medical College, Calcutta, is confirmed by the Demonstrator of Biology and the Professor of Pathology and Bacteriology of the College, and by the Health Officer of Calcutta.

The author's account is " A beautiful adult taenia . . . a small tapeworm, bottleshaped and made up of a head, a neck, and three segments. The head was provided with suckers and a rostellum armed with hooklets. The suckers and hooklets overlapped and it was possible to count only 2 suckers and 6 hooklets." Professor DE " agreed that this was an undoubted adult taenia." The Health Officer wrote, " The sample is a small taenia having 3 or 4 segments which could not be well differentiated. There were a number of hooklets which could not be counted. No suckers could be noticed." [If any specimen is still available one of the skilled helminthologists

at the Tropical School, Calcutta, would be able to say whether this unexpected object was really an adult with its double row of 28 to 50 hooks, of distinctive shape.] *C. L.*

COUTELEN (F.). Contrôle expérimental de certaines hypothèses récentes relatives au cycle évolutif du ténia échinocoque et à la prophylaxie de l'échinococcose. [**The Evolutionary Cycle of** *T. echinococcus.*]—*Rev. Méd. et Hyg. Trop.* 1936. May–June. Vol. 28. No. 3. pp. 161–178. [19 refs.]

Coutelen's conclusion is that, in spite of some recent work, the normal hosts of the echinococcus worm are dog for definitive and sheep, cattle, pigs and horse for larval hosts. There may be other, abnormal, hosts. In chickens, pigeons and turkeys infective hydatids were not formed. Re-encapsulation takes place in the livers of certain white mice after the injection of hydatid sand into the peritoneal cavity.

C. L.

BARNETT (Louis). **Hydatid Disease in New Zealand. Prevalence, Prevention and Research.**—*New Zealand Med. Jl.* 1936. Aug. Vol. 35. No. 188. pp. 214–220.

A record of hydatid disease in New Zealand covering 45 years.

In this period there were admitted into public hospitals in New Zealand 3,051 cases with 301 deaths, and there have been 262 deaths outside hospitals or 563 in all. The numbers of admissions of hydatids as compared with all patients was as 1 to 362 in 1915 and 1 to 823 in 1935; in 1935 it was 1 to 1,302 in N. Island and 1 to 483 in S. Island. Infection in sheep is as bad as ever; more than 80 per cent. of old sheep have it. It is estimated that in man there are in New Zealand about 125 cases a year with a death rate of 15 to 16 per cent. *C. L.*

TURNER (Edward L.), DENNIS (E. W.) & KASSIS (I.). **The Incidence of Hydatid Disease in Syria.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 225–228.

Hydatid infections in Beirut were 22·1 per cent. of 1,156 sheep and goats, 45·1 per cent. of 201 cattle; in Damascus were 28·5 per cent. of 1,596 sheep and goats, and all of 6 camels; in Homs 41·4 per cent. in sheep and 13·8 per cent. in goats, the total numbers being 551, and all of 5 camels; in Aleppo 27·8 per cent. of 1,126 sheep and goats and all of 4 camels. Among 14,057 patients admitted to the medical, surgical and pediatric sections of the American University Hospital, Beirut, there were 63 with infection. *C. L.*

i. PENFOLD (W. J.) & PENFOLD (H. Boyd). **The Diagnosis of** *Taenia saginata* **Infestation.**—*Med. Jl. Australia.* 1936. Mar. 7. 23rd Year. Vol. 1. No. 10. pp. 317–321. With 8 figs.

ii. PENFOLD (H. Boyd). **The Treatment of Patients infested with** *Taenia saginata,* **with Special Reference to Certain Unusual Results.**—*Med. Jl. Australia.* 1936. Mar. 21. 23rd Year. Vol. 1. No. 12. pp. 385–398. With 1 fig. [23 refs.]

i. A note on the well-known methods of diagnosis of *Taenia saginata* with useful figures.

ii. Detailed instructions are given for treatment based on experience of 86 cases.

The drug of election is a reasonably fresh extract of male fern. Seeing that the active principle is possibly not the oleoresin no weight is put on the particular percentage in which it should be present in the extract. The dosage should be according to the weight of the patient, these being the doses for one in hospital, with less for one who is not—7 to 9 stone 2 drachms, 9 to 10·5 stone 2·5 drachms, over 10 stone 3 drachms. They should be given in two or more portions within an hour and 2 hours after the last portion a purgative should be given, and when there has been an action the patient is discharged from hospital. There must be starvation before the drug and no more must be given for some days, though any part of the dose which has been vomited may be put back by stomach tube. There was cure in about 90 per cent. of these cases, and if no head is seen a second treatment should not be given unless segments reappear, for it may have undergone digestion or been missed. In 2 cases segments came away after anaesthesia by ethylchloride and ether and then no more were ever seen. Spontaneous cure is very rare. *C. L.*

PENFOLD (W. J.), PENFOLD (H. Boyd) & PHILLIPS (Mary). **Acquired Active Immunity in the Ox to** *Cysticercus bovis.*—*Med. Jl. Australia.* 1936. Mar. 28. 23rd Year. Vol. 1. No. 13. pp. 417–423. With 8 figs.

Evidence is given that the authors have in fact brought about an active immunity to *C. bovis* in oxen.

Many cattle are slaughtered in the abattoirs, and all were found free from infection. Of 88 oxen bought in the open market and fed with ova of *T. saginata* there was development of *Cysticercus bovis* in all, that is to say there is no natural immunity to this infection. The next step was the study of infections 15 days to 1 year old. No cysts were alive after 9 months, few after 7 ; young degenerated cysts had moist green pasty contents, in old ones these were dry, dirty yellow, hard and crumbly, and with experience their age could be roughly judged on inspection. Two oxen were drenched with 400,000 eggs each (eggs proved to be active) and a year later the dose was repeated ; when killed 11 weeks later all cysticerci were of the first infection, in one there were very few, in the other many. Other tests extended the period of immunity to 79 weeks. Again, in cattle grazing on a farm fertilized by crude sewage, the percentage of infected beasts got less the longer they had grazed there, being 46 after 6 months, 33 after 15 months and 14 after 3 years. This immunity is twofold : firstly the death of cysts of the primary infection, secondly the prevention of the development of cysts from later infections. *C. L.*

BACARDÍ (J. Fermoselle) & DEL PINO (A. Portuondo). *Dipylidium caninum.* Caso humano. [**Human Infestation by** *Dipylidium caninum.*]—*Rev. Parasit. Clin. y Lab.* Habana. 1936. May–June. Vol. 2. No. 3. pp. 343–347. With 2 figs. English summary (8 lines).

A segment of a cestode was brought to the author's laboratory and found to be that of *D. caninum.* The patient was a child of 16 months ; she was nervous and restless, and a history was given of gastro-intestinal disturbance, frequent diarrhoea, nocturnal restlessness, " having

on various occasions tumbled out of bed." She was treated with a small teaspoonful of Kuba and the rest of the worm was passed together with a female ascaris. Subsequent examination of the faeces on two occasions revealed Ascaris ova in large numbers. An account of *D. caninum* and its life history is given and a photograph of the worm as passed in the child's stool and a photomicrograph of the gravid segment.

H. H. S.

CHICK (Eleonore). Zur multiplen Zystizerkose des Menschen.—*Muench. Med. Woch.* 1936. Apr. 24. Vol. 83. No. 17. pp. 694–696. With 2 figs. [12 refs.]

PEREIRA (C.) & VAZ (Z.). Toto-montagem de nematoides; nova e simples tecnica para montagem em balsamo. [**Mounting of Nematodes entire.**]—Reprinted from *Arquivos Inst. Biol.* 1934. Dec. Vol. 5. pp. 77–86. With 7 figs. on 3 plates. [14 refs.] English summary.

A method by which in the authors' belief good permanent preparations of nematodes may be got.

On a slide make a pool of absolute alcohol and in it put the nematode after fixing. With blotting paper remove the excess of alcohol and cover the worm with 5 per cent. celloidin solution. Float the reversed cover in 95 per cent. of alcohol for 3 minutes and, when so dehydrated, in beech-wood creosote for 20 minutes. Pick up the cover, put it down preparation side up, remove excess fluid and put on it a drop of natural, thick-flowing Canada balsam and mount on a slide. The balsam must not contain xylol or there will be shrinkage.

Directions are given for previous staining if that is desired. *C.L.*

BUTCHER (W. H.). Further Observations on Roundworm Infestation.—*Med. Officer.* 1936. Sept. 19. Vol. 56. No. 12. pp. 124–125.

PANISELLO (Fernando Sala), JIMENEZ (Juan A.) & GUERNICA (Antonio). Enterocolitis y apendicitis por ascaridiasis y tricocefalosis. [**Enterocolitis and Appendicitis associated with Ascaris and Trichuris.**]—*Archivos Med. Infantil.* 1936. July-Aug.-Sept. Vol. 5. No. 3. pp. 284–297. With 7 figs. [21 refs.] English summary.

At the Children's Hospital, Havana, the authors examined [method not stated] the faeces of 1,443 children for presence of helminth ova, particularly those of Ascaris and Trichuris. They found one or other (or both) in 603 (41·7 per cent.) and "other parasites" [not named] in another 218. They had been impressed by the number of children who were infested with these worms and who presented signs of enteritis or colitis and appendicular troubles. 3·7 per cent. had Ascaris only, 30 per cent. Trichuris only, and 8 per cent. had both. Clinical details and an account of the post-mortem findings are given of one child of 2 years who died 11 days after admission for colitis and enteritis. Trichuris were seen in considerable numbers in the mucus of the colon and an Ascaris occupied the lumen of the appendix (see illustration) p. 24, which, however, had not perforated. [There is no reference to the number of cases with helminthic infestation in which symptoms of appendicitis were present.] *H. H. S.*

Caecum, adjacent colon and appendix showing the ascaris in the lumen of the last.
[Reproduced from *Archivos de Medicina Infantil.*]

FONSECA (Rafael Calvó). Los vermes intestinales y la apendicitis. [**Appendicitis and Intestinal Helminthiasis.**]—*Rev. Parasit. Clin. y Lab.* Habana. 1936. May–June. Vol. 2. No. 3. pp. 471–482. English summary.

During the second half of 1935 at the Municipal Emergency Hospital of which the author is senior physician 375 operations were performed, and among the appendices removed 20 contained helminths (5·3 per cent.) ; among 53 children between the ages of 5 and 14 years there were 6 (11·3 per cent.). The proportion was much greater among those with symptoms of acute disease, 11 out of 61, or 18 per cent. The commonest infestation found was Enterobius, in 15 of the 20 ; Trichuris was found in 5, and Ascaris once. *H. H. S.*

CH'IN (K. Y.). **Ascaris in Liver causing Fatal Hemorrhage. Report of a Case.**—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 119–124. With 2 figs. on 1 plate. [13 refs.]

Seemingly a unique case of death caused by haemorrhage from the liver due to mechanical tearing by an Ascaris.

"A pregnant Chinese woman was admitted into hospital with what she thought to be labor pain. She passed blood clots per rectum and vomited blood. Tenderness without rigidity over lower abdomen. Uterus enlarged as in full-term and in tetanic condition. Cervix dilated to 3 cm. Membranes intact and no vaginal bleeding. Caesarean section and left salpingo-oöphorectomy were done with delivery of a macerated foetus. At operation free blood was found in the peritoneal cavity but the source of bleeding could not be ascertained. Patient died one day after operation. Autopsy showed that the hemorrhage was due to rupture

of the capsule overlying a subcapsular hematoma which was continuous with an intrahepatic hematoma in the right lobe of the liver. In the center of the intrahepatic hematoma, an ascaris was found. The intrahepatic bile ducts were markedly dilated and another ascaris was found inside a bile duct in the left lobe. Extrahepatic ducts also dilated. Blood clots were found in the gall-bladder and small intestines." *C. L.*

LEATHERS (W. S.), KELLER (A. E.) & WYMAN (B. F.). **A State-Wide Investigation of Hookworm in South Carolina.**—*Amer. Jl. Hyg.* 1936. May. Vol. 23. No. 3. pp. 600–614. With 3 maps & 1 graph.

The paper deals in terms of its title with 28,875 specimens of faeces, mostly from white school children.

The percentage of infection to the Stoll-Hausheer small drop method was 24·8 as compared with one of 37·3 got by the Rockefeller Sanitary Commission (1910–1914), evidently with a smear of unstated size. "This represents a decrease of 33·5 per cent. in incidence since the Rockefeller Sanitary Commission's work." The peak of 32·4 was at the age of 20–24. Infection has lessened most in the clay areas, is higher in males than females at all ages. The mean intensity (males, females and totals) was 4,200, 3,300 and 3,800 eggs per cc., and was highest at ages when the percentage of infected persons was greatest. Here again heavy infections were apt to run in families. It is noteworthy that of 595 specimens from negroes living in 6 counties only 7 per cent. were infected. [The reviewer has checked one figure only, that in Table 2 of their paper which reports a great fall in the percentage of infection as having taken place in Saluda County since 1914, one from 41·2 to 8·5. The actual infection figures up to 1914 are 77 of 1,868 or 4·12 per cent., and at present 7 of 82 or 8·5 per cent. A careful search through the Commission's Annual Reports has disclosed Saluda County once only (p. 78 of Report for 1914) with a percentage of infection of 4, so that the percentage now published based seemingly on further figures still unpublished or published elsewhere, is practically the same as the Commission's and so confirms that there is a doubled infection rate here after 22 years.] *C. L.*

i. LUTRARIO (A.), ILVENTO (A.) & MAZZITELLI (M.). La diffusion actuelle de l'ankylostomiase en Italie et dans ses colonies. [**Ankylostomiasis in Various Countries.**]—*Bull. Office Internat. d'Hyg. Publique.* 1936. Aug. Vol. 28. No. 8. pp. 1488–1499. With 7 maps (2 folding).

ii. CUMMING (Hugh S.). L'ankylostomiase aux États-Unis.—*Ibid.* pp. 1500–1508.

iii. KHALEK (Khalil Abdel). La pollution su sol par les ankylostomes en Egypte.—*Ibid.* pp. 1509–1510.

iv. RUSSELL (A. J. H.). Sur l'ankylostomiase dans l'Inde Britannique. —*Ibid.* pp. 1511–1512.

v. TIMBAL (G.). L'ankylostomiase en Belgique.—*Ibid.* pp. 1513–1515.

vi. MORGAN (M. T.). L'ankylostomiase en Grande-Bretagne.—pp. 1516–1517.

vii. JITTA (N. M. Josephus). Quelques données sur l'ankylostomiase en Hollande.—*Ibid.* pp. 1518–1520.

viii. PODIAPOLSKA. L'ankylostomiase en U.R.S.S.—*Ibid.* pp. 1521–1524. [11 refs.]

A series of reports made to the Permanent Committee of the International Office of Hygiene at its Session of May, 1936.

i. After an incomplete survey of the presence of hookworm infection outside Italy it is made clear that the distinction between carriers and sick is strongly held. It is noted that there has since 1890 been a steady spread. Thus in 1890 the infection was known in 37 provinces; in 1912 in 14 more. When in 1933 notification was made compulsory, infection was reported from 43 communes in which it had not been known before. The basis of diagnosis—clinical or microscopical and if so by what technique—is unstated. The worm is said nearly always to be "*A. duodenalis Dubini.*" No case has been reported in 20 years in the whole of Libia—suspected cases in Eritrea have proved negative and it is held decisively that there is no infection there. In Somaliland 33 per cent. of 3,250 cases were infected to the microscope. [In the absence of indication of the delicacy of the tests used these figures will not, it is hoped, be quoted as exact.]

ii. A history of hookworm work in the United States, from which the name of STILES is absent even when *Necator americanus* is mentioned and though Dubini is credited with the name of *A. duodenale.* Beside the name of Rockefeller [who set up the "Sanitary Commission for the eradication of hookworm disease" with STILES as Scientific Secretary] is put that of Ford whose cars brought about the demand for proper roads and so made investigation and supervision in hookworm work easier. It is pointed out that a theoretic degree of infection as judged by egg counts, is a very different thing in a weak child of 6 and in a strong man of 22. It is a mistake to concentrate attention on the severe case. Now that these have become very few the mild ones will get the attention they deserve.

iii. In shady places where the young and very young defaecate, 4 per cent. of soil samples contained hookworm larvae and the soil stayed infective for 6 to 8 weeks. In prevention, the measures advised are propaganda, treatment, and the installation of latrines [which seem to be bore-hole latrines]. At the village of Bahtim, 20 km. north-east of Cairo, the percentage of infection fell from 32 to 16 five years after the making these latrines. Whether the same method of diagnosis was used before and after, and whether it was a single factor experiment with no treatment given, is not stated.

iv. In Southern India infection is widespread. The percentage of infection [to unstated methods of investigation] may be as low as 20, is mostly above 75 and may be as high as 95. Soil contamination is highest in tea gardens. Bored-hole latrines to the number of 317 were made in Partabgarh "with the best results."

v. Hookworm infection has been banished, or nearly so, from the Liège coalfield. The figures of discovered infection here were 8·5 in 1904 to 1910. The percentage of positive examinations was 0·47 in 24,278 persons in 1915 and 0 in 5,764 in 1933; those for 1934 and 1935 were 0·029 in 3,395 and 0·032 in 6,242 in 1935. The measures taken for arrest of the disease, which had been in force since 1921, have been faecal examination of every worker in a mine, and of everyone who starts work in any mine, to be repeated 30 to 40 days later. All found infected are treated. As to latrines, those on the surface must be sufficient and convenient, those below with removeable buckets.

vi. It is only in the Cornish tin mines that the infection has been found, having been detected there in 1902. No case has been notified since 1914, though workmen's compensation would be paid to any infected person. Sanitary regulations have brought about the stopping

of defaecation in abandoned galleries; this and the flooding and pumping out of the mines has brought about the disappearance of the disease, while baths and drying of clothing are of help in prevention.

vii. Infection was noted in brick fields of Limburg in 1876 and in coal mines later. From 1906 miners were examined, surface latrines and lavatories set up, and buckets provided for latrines underground. The greatest number of men found infected was 83 of 11,000 in 1917. In 1925 legal ordinances were withdrawn but the mine authorities continued to keep watch. Thus in 1930 two carriers of worms or their larvae were found in immigrants in 4,997 specimens. The ventilation of the mines is good, they are not damp and their temperature is not high. [The mention twice of larvae in stools raises, of course, the question of Strongyloides unless the stools were old. Whether the same method of examination was always used and what it was are unstated.]

viii. In Russia the infection was known before the revolution only in those who pierced the Sourame tunnel on the Trans-Caucasian railway. It is widespread in Azerbaijan, particularly at Lenkoran on the Persian frontier, and in the west of Georgia but is absent in Armenia. Most infections are with Necator. The incidence is patchy, lies between 59 and 80 per cent. in natives and is only 8 in others. Collection of worms from 708 cases has shown recovery generally of 10 or less, in none were over 500 found. Infection is almost completely absent in the well regulated mines of Tkvartchel though there is a 68 per cent. infection on the surface. The techniques of examination are not mentioned. *C. L.*

MAZZITELLI (M.). Il tetracloruro di carbonio considerato come attivatore diagnostico dei portatori di anchilostoma. [**Carbon Tetrachloride as Activator for Diagnosis of Hookworm Carriers.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. June. Vol. 17. No. 6. pp. 334–341. [13 refs.]

Infestation by hookworms, the author states, is more widespread among those living in the Avenza plains than is generally believed. The number of persons whose faeces were examined [? direct smear] was small, only 60, their ages ranging between 3 and 6 years. At the first examination 17 specimens were found to contain the ova, 43 were negative. He then administered carbon tetrachloride in the following doses: to adults 3 capsules, containing each 1·2 cc.; to those between 10 and 18 years 5 capsules, each of 0·6 cc., to those under 10 years, 3 capsules each of 0·6 cc. Further examination of the stools was made and this time 29 were positive, among them 12 of those who had before shown no ova. *H. H. S.*

BERNY (P.). Tuberculose et ankylostomiase. [**Tuberculosis and Hookworm Infestation.**]—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 471–474.

Of 30 tuberculous cases 11 had hookworm eggs to Willis' technique (37 per cent.) while in 2,884 routine cases examined at the Cayenne Institute of Hygiene the percentage was 52. *C. L.*

PEÑA CHAVARRÍA (A.) & ROTTER (Werner). Estudios hematologicos y anatomopatologicos sobre la anemia anquilostomiatica. [**Haematological and Pathological Studies on Hookworm Anaemia.**]—*Bol. Ministerio de Sanidad y Asistencia Social.* Caracas. 1936. June. 1st Year. Vol. 1. No. 4. pp. 311–326. [20 refs.]

[The subject matter of this paper is dealt with at length in the special article by Colonel Clayton LANE (see above, p. 1) hence there is no need for detailed abstract here.] Investigation of the blood condition of 80 cases of ankylostomiasis and of 96 autopsies of patients dying of hookworm anaemia in the Hospital de San Juan de Dios has led the authors to the following conclusions:

1. The reticulocyte curve is the best gauge of reaction on the part of the haemopoietic organs.
2. This indicates that expulsion of worms *plus* administration of iron is the greatest stimulus to blood regeneration, whereas 12 days of anthelmintic treatment alone produced no reticulocyte response.
3. Those districts furnishing most cases of severe hookworm anaemia are those where least meat is eaten per head.
4. Hookworm anaemia is an *anaemia ferripriva* not due to diet alone, because cases of anaemia of alimentary origin in the district do not show deficiency of iron in the tissues.
5. In cases of intense anaemia the marrow of the long bones shows signs of considerable aplasia, even in children below the age of 15 years.
6. Hookworm anaemia may cause thrombosis and embolism with the characters of a progressive thrombopathy. Of the 96 autopsies referred to, in 61 per cent. there was a thrombosis, whereas in another 1,764 it was found in 16 per cent. only.
7. This tendency to thrombosis is to be sought in the blood changes, in the slow circulation from fatty myocarditis, and the "hydropic constitution" from dietetic deficiency. *H. H. S.*

CRUZ (W. O.). Sobre o mechanismo de formação das hyperglobulias de origem toxica. [**On the Production of Excess of Erythrocytes by Toxins.**]—*Mem. Inst. Oswaldo Cruz.* 1936. Vol. 31. No. 2. pp. 349–355. With 1 graph. English summary.

Toxins may produce rise in red blood corpuscles and in haemoglobin by contraction of the spleen.

As seen in Table I, two cases were given 5 treatments with oil of chenopodium, and the haemoglobin rose after about 4 months from 30 to 53 in one case, and from 23 to 53 after about 7 months in the other. In Table II are seen the effects of chloroform in a person who had also had 10 cc. of a 40 per cent. solution of chloretone in alcohol; the red cells increased from 5 to 6·2 million per cmm. and the haemoglobin rose from 75 to 86 after one day, falling to 80 after 2 days, at which time he died. A third Table shows that in a woman whose spleen had been taken out there was no such rise. On these facts, it seems, it is concluded that the rise in erythrocytes and haemoglobin has a toxic cause in both sets of experiments and that the principal factor lies in a spleen contraction, probably induced by a hypotension which was observed, a contraction which brings forth "a launching into the circulatory torrent of concentrated blood (splenic slime), normally kept in reserve in the spleen." *C. L.*

JOLLY (A.). L'anémie pernicieuse progressive et la cachexie aqueuse dans l'uncinariose. Considérations générales et aspect clinique. [**Hookworm Anaemia and Oedema.**]—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 785–798.

Details are given of 9 cases of severe anaemia from hookworm infection held to be clinically identical with the type described under the name of Biermer's anaemia, that is to say of Addisonian pernicious anaemia.

In comment this has to be said. Addisonian pernicious anaemia is a megaloblastic hyperchromic anaemia. In none of these cases is the size of the red cells noted, in one only is the percentage of haemoglobin given. The cases are of the sort familiar to those whose reading has included the early reports of the Rockefeller Commission. They had grave anaemia, oedema and serous effusions and improved with unworming. The old observation that absence of eosinophilia is a grave sign is reaffirmed. *C. L.*

FOSTER (A. O.). **On a Probable Relationship between Anemia and Susceptibility to Hookworm Infection.**—*Amer. Jl. Hyg.* 1936. July. Vol. 24. No. 1. pp. 109–128. With 2 graphs. [14 refs.]

Susceptibility to hookworm infection in dogs and cats was, it is claimed, made greater by periodic bleeding and by a milk (iron deficient) diet. The findings "are interpreted as indicating a probable [inverse?] correlation between anaemia and resistance to hookworm infection."

Experiments put through in 1932–33 are now made public. They are of two sorts, periodic blood loss and a milk diet, but in Foster's belief iron deficiency is probably at the back of both series of experiments. In general, infective larvae of *A. caninum* were given by mouth it is gathered; bleeding was by puncture of the heart; the milk diet was made up of these percentages: whole milk powder 72·3, cane sugar 18·7, calcium carbonate 9·0; it had an iron percentage of about 0·000225, and all animals (except 2 pups used for infection with *Necator americanus*) died while taking it.

As to bleedings, details are given in a table of 3 of the 4 dogs which did not die from these. Up to day 368, they were given different quantities of larvae and the bleedings were at different intervals over different periods of time. Bleedings then stopped and thereafter the dogs had the same doses of larvae on the same days. As compared with day 368 there took place on day 424 (or 417) these changes in haemoglobin percentage and eggs passed per day (in thousands): Dog 730 a rise from 28 to 60 and from 299 to 3,149; Dog 752 a rise from 32 to 68 and a fall from 506 to 253; Dog 755 a rise from 38 to 56 and a fall from 175 to 97.

As to diet, 3 dogs which had by repeated infection with *A. caninum* become very resistant were put on the milk diet, and the periodic giving of larvae was continued. In these conditions the egg output was not materially changed, but they lost about half their body weight. To 2 pups on the milk diet 4,000 infective larvae were given, half by mouth and half by skin, and in their intestines were seen on autopsy 5 and 31 worms "with no indication of sexual maturity, however, although the worms were otherwise mature"; this being, it is believed, the first report on *N. americanus* to this stage in the dog. As to 5 cats,

infected with the cat strain of *A. caninum*, there was in 2 an increase in the daily output of eggs at or within a week of death, while in 3 there was not. The number of larvae given at one time varied from 125 to 30,000 and the intervals between infections from 2 to 117 days. One, C. 533, had been on a normal diet for 432 days, and by then had been given 10,115 larvae and was passing 13,000 eggs a day; it was then put on the milk diet and had given it, in 3 doses, 17,200 more larvae, but, in spite of this, 56 days later eggs could be found only by D.C.F., whereon a dose of 30,000 larvae produced 19, 26 and 30 days later 6,000, 15,000 and 6,000 eggs a day, death taking place on the last of these days. [These very variable results hardly merit the drawing of general conclusions.] *C. L.*

QUENARDEL. Observations sur le traitement de l'ankylostomiase.—*Bull. Soc. Méd.-Chirurg. Indochine.* 1936. Apr. Vol. 14. No. 4. pp. 388–394.

DE GIORGI (Mario). Della profilassi della anchilostomiasi con la calciocianamide. (Contributo sperimentale.) [**Calcium Cyanamide in Hookworm Prophylaxis.**]—*Giorn. Ital. di Malat. Esot. e Trop.* 1936. Aug. 31. Vol. 9. No. 8. pp. 172, 175.

A confirmation of the observation of STÉVENEL and BERNY that cyanamide of calcium in a strength of 1 in 3,000 kills hookworm larvae and prevents development of the eggs. *C. L.*

VAN DER BERGHE (Louis). **On the Occurrence of a Species of** *Ancylostoma* **closely related to** *A. duodenale* **in an African Lemir.**—*Jl. Parasitology.* 1936. Apr. Vol. 22. No. 2. pp. 224–226. With 1 fig.

An ancylostome is described from 2 male specimens got from the lemur, *Galago crassicaudatus*, akin to *A. duodenale* is given subspecific rank under the name *A. duodenale galagoi*.

It is separated from *A. duodenale*, because the host is purely arboreal, because in the area *A. duodenale* is unknown to man, because the general measurements were small, because the "third or posterior pair of teeth" are slightly larger than in *A. duodenale* and the spicules are shorter (1·4 mm.). [There are those who will hold that in fact a fresh and non-optimum host of *A. duodenale* is here added to the list, because in such hosts *A. duodenale* is as already known apt to be dwarfed, that it is not possible to prove a universal negative for human infection in the area even if intensive work had been done on the matter, and that the drawing suggests a flattened specimen with teeth seen from an unusual angle and so with an unusual outline. If these lemurs never reach the ground it seems that for infection to occur in them their use of a tree branch as a drop latrine must be as careless as that of some of their human cousins.] *C. L.*

NOLASCO (J. O.) & AFRICA (Candido M.). **A Fatal Case of Paralytic Ileus associated with Severe Strongyloides Infestation suggesting Internal Autoinfection.**—*Jl. Philippine Islands Med. Assoc.* 1936. May. Vol. 16. No. 5. pp. 275–283. With 6 figs.

[The suggestion in the title seems well based.]

A leper with heavy strongyloides infection died with abdominal pain and distension, and vomiting. The whole intestine from duodenum to ileocaecal junction was distended and its wall thickened.

There was no organic obstruction. The caecum showed small polypoid growths.

"Histological examination of the jejunum, ileum, large intestine, and appendix showed filariform larvae in the mucosa, submucosa, muscularis, and subserosa. The number of parasites counted and found in only one histological section varied from 8 to 21. In the section of the large intestine where 21 parasites were found, 7 were in the mucosa, 3 in the submucosa, 2 in the muscularis, and 9 in the subserosa. Where there were fewer parasites, a similar distribution was found in the different layers of the other portions of the intestinal wall. In the large intestine the small polypoid growths were found to be due to small, organizing, submucous abscesses in connection with the base of dilated glands of Lieberkühn. Some of these glands showed small cystic dilatations. Pseudo-tubercles, which were also found in all the sections, in the submucous, muscular, and subserous coats, were especially pronounced in the subserous layers. Many of the pseudo-tubercles were in definite relation with what appeared to be dead larvae in process of disintegration. In the meso-appendix clear-cut sections of the actively invading, living larvae without any cellular accumulation around them were found after examination of several serial sections. In fig. 5 is shown a filariform larva, also in the meso-appendix, with a few epithelioid cells and a giant cell around it. In the liver larvae of a few parasites were found, some of them surrounded by pseudo-tubercles." *C. L.*

FAUST (Ernest Carroll). Strongyloides and Strongyloidiasis.—*Rev. Parasit., Clin. y. Lab.* Habana. 1936. May–June. Vol. 2. No. 3. pp. 315–341. With 1 fig. [47 refs.]

MATOFF (Konstantin). Beobachtungen ueber die larvale Entwicklung von *Strongyloides papillosus* (Wedl, 1856) und Infektionsversuche mit filariformen Larven.—*Ztschr. f. Parasitenk.* 1936. Apr. 18. Vol. 8. No. 4. pp. 474–491. With 8 figs. [15 refs.]

BLUMER (George). **Trichinosis, with Special Reference to Changed Conceptions of the Pathology and their Bearing on the Symptomatology.**—*New England Jl. of Med.* 1936. June 18. Vol. 214. No. 25. pp. 1229–1235. [19 refs.]

The infection is a septicaemia and the embryos are carried to organs in which encystment does not take place.

It is not an infection of the skeletal muscles only. Note is made of 3 groups of unusual cases, with case histories in illustration; those in which there is prominence of heart symptoms from myocardiac damage, of nervous symptoms with lesions in the central nervous system, and of evidence of renal damage. For treatment there is no specific substance and if there were Blumer is doubtful whether its use would be wise in view of the large numbers of larvae often present and the results of flooding the body with their death products. For prevention, meat inspection is of no use, for as STILES pointed out many years since, of 6,329 cases with 318 deaths which took place in Germany 2,402 cases and 112 deaths were in those who had taken food which had been let through to the trade as free from trichinae after inspection. Prosecutions of meat dealers are not then right. Food must be properly cooked. *C. L.*

MERRITT (H. Houston) & ROSENBAUM (Milton). **Involvement of the Nervous System in Trichiniasis.**—*Jl. Amer. Med. Assoc.* 1936. May 9. Vol. 106. No. 19. pp. 1646–1649. [33 refs.]

Details of 2 cases of involvement of the nervous system in trichinosis are given as well as a survey of the literature.

The main comments made are these. For diagnosis, a history of the taking of pork, eosinophilia often late, antigen skin tests and muscle biopsy positive, a normal cerebrospinal fluid, no widespread subcutaneous oedema. Prognosis in those with only muscular weakness or no reflexes is very good, recovery being complete or nearly so; in those with mental symptoms or signs of focal lesions in the central nervous system much more serious, death taking place in 46 per cent. of the reported cases. *C. L.*

*TRAWINSKI (A.). Studien ueber Immunität bei Trichinose. [**Immunity to Trichinella Infestation.**]—*Zent. f. Bakt.* I. Abt. Orig. 1935. June 14. Vol. 134. No. 3–4. pp. 145–149.

It was established that the lethal dose of trichinae for white rats, particularly susceptible animals, was about 200 of these, for with this dose about 90 per cent. of them died in 10 to 15 days after the administration of the infective material. When infective muscle is washed, pulverized, and suspended in normal saline no serum can be got which is active in immunizing rabbits. On the other hand a serum taken from heavily infected rabbits between the 25th and 35th days is very active for infected rats. Rats given 3 times the lethal dose or more of muscle trichinae withstand the infection well, and live, provided they are given subcutaneously three 1 cc. doses of this serum, which is antitoxic, not antiparasitic. *C. L.*

ROTH (Hans). Ueber das Vorkommen pränataler Trichinenuebertragung bei künstlich infizierten Meerschweinchen. [**Experimental Infestation of Guineapigs** *in utero* **with Trichinella.**]—*Zent. f. Bakt.* I. Abt. Orig. 1936. Apr. 30. Vol. 136. No. 5–6. pp. 278–284. [16 refs.]

Prenatal trichinosis has been caused experimentally in guineapigs. Ten mothers were infected and bore 22 young; 9 of these were infected and when their bodies were digested in acid pepsin solution there was recovery of 1, 2, 4, 13 to 19, and 126 measles. *C. L.*

GALLIARD (Henri). La filariose à *Wuchereria bancrofti* dans la région da Hanoi (Tonkin). [*W. bancrofti* **Infestation in Hanoi (Tonking).**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1936. May. Vol. 14. No. 5. pp. 439–441.

In 200 persons not suffering from signs of filariasis and examined between 11 p.m. and midnight microfilariae were found in thick drop preparations 12 times, and it is noted that there is no need to examine more than 2 preparations. MATHIS and LEGER in 1911 found an infection rate of 9 in 300 prisoners at Hanoi. Periodicity is marked, for in 180 sick examined in hospital at 10 a.m. microfilariae were numerous twice only. There is no parallelism between physical signs and the

* This fuller summary should be read in place of that in Vol. 33, p. 124.

numbers of microfilariae in the blood; thus in 2 cases only were there as many as 60 of these to the drop, in them there were no clinical signs of infection, and in those who have such signs there were very few microfilariae. Eosinophilia when present may have been caused by intestinal worms and was not constant in those with physical signs. Transmission was by *Culex fatigans* and *Anopheles hyrcanus* while attempts with *Armigeres obturbans*, *Aëdes argenteus* and *A. albopictus* were failures. *C. L.*

SUNDAR RAO (S.). **Filariasis in Patnagarh (Orissa Feudatory State).**—*Indian Jl. Med. Res.* 1936. Apr. Vol. 23. No. 4. pp. 871–879. With 1 map.

"1. Patnagarh in Orissa, a small rural type of town, has endemic filariasis; the infection consists entirely of '*Filaria*' *malayi* Brug. The gross infection rate is 17·8 per cent. and the filarial disease rate is 3·3 per cent. The types of filarial diseases are either filarial lymphangitis or elephantiasis of the limbs. Elephantiasis of the legs is the most common filarial affection. Elephantiasis of the genitals, hydrocele and chyluria are entirely absent.

"2. Transmission of the infection is primarily through the agency of *Mansonoides annulifera* which is the commonest species of mosquito in Patnagarh. The species showed an infection rate of 20·9 per cent. under natural conditions. *M. uniformis* plays a secondary part in transmission. Species of *Culex* and *Anopheles* do not appear to be concerned with the transmission. The breeding places of *mansonoides* are the large tanks densely covered with Pistia which occur in the area surrounding the town." *C. L.*

ABE (Shinichi). **Some Results on Blood-Examination for searching the Existence of** *Microfilaria Malayi* **in Japan.**—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1936. Mar. Vol. 35. No. 3 (372). [In Japanese pp. 689–696. [23 refs.] English summary p. 697.]

Microfilaria malayi was not found in blood examinations of 915 soldiers from districts south of Tokio, though *Mf. bancrofti* was seen in 78 of them. *C. L.*

KEIL (Ernst). Zur Behandlung des Filariaanfalles mit Prontosil. [**Filariasis treated with Prontosil.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Sept. Vol. 40. No. 9. pp. 400–405. [13 refs.]

In 9 lepers prontosil had no effect on the numbers of *Mf. bancrofti* in the blood. *C. L.*

O'CONNOR (Francis W.) & BEATTY (Harry). **The Early Migrations of** *Wuchereria bancrofti* **in** *Culex fatigans*.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. June 30. Vol. 30. No. 1. pp. 125–127. With 2 figs. on 1 plate.

The authors' summary is as follows:—

"1. Within 45 minutes after *Culex fatigans* feeds on a person whose blood contains *Microfilaria bancrofti*, exsheathed larvae are seen outside the stomach, having apparently passed through the undamaged wall of the viscus to enter the abdominal cavity.

"2. In St. Croix within 2 hours after such a feed newly arrived larvae are found in the thorax of the insect.

" 3. Between 10 and 18 hours, possibly longer or shorter according to climatic conditions, larvae mass in large numbers and are found to be very active in the anterior part of the midgut of the insect. Reversed persistalsis of the viscus may or may not play a part in the movements of the parasites along this structure.

" 4. The penetration by the parasites through the walls of the midgut to the exterior has been observed.

" 5. Thus exsheathed *W. bancrofti* larvae from the stomach of *Culex fatigans* may reach the thorax by the abdominal route or later, and probably in larger numbers, by the route of the anterior midgut.

" 6. By modifying well known methods of dissection and staining, a technique has been devised whereby permanent preparations may be made which illustrate some of the foregoing facts." *C. L.*

MENON (K. P.) & SEETHARAMA IYER (P. V.). **The Viability of the 'Infective' Forms of the Larvae of** *Wuchereria bancrofti* **when Freed from the Mosquito Host.**—*Indian Jl. Med. Res.* 1936. Apr. Vol. 23. No. 4. pp. 881–883.

Since infective larvae freed from naturally infected *Culex fatigans* can live in tap water from 4½ to 6½ hours, it seems that if they can get free in nature infection might take place (as MANSON originally suggested) from drinking water, particularly as they can live in 0·2 per cent. hydrochloric acid for 20 to 45 minutes if it is mixed with 10 per cent. egg albumin. In the unadulterated acid of this strength they do not live beyond 12 minutes. *C. L.*

FENG (Lan-Chou). **The Development of** *Microfilaria malayi* **in** *A. hyrcanus* **var.** *sinensis* **Wied.**—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 345–367. With 2 charts, 1 fig. & 4 plates. [20 refs.]

The study was put through at a room temperature of 29°–32°C. Microfilariae begin to leave the " stomach " of the mosquito in 3 hours and migration is complete in 10 hours. There is no mention of any collection of them in the anterior tubular part of the midgut. If the sheath is not fully got rid of, an undeveloped monster larva is passed. In the body of the mosquito active migration takes place to all parts, and two more moults take place in it, the tail of the microfilaria with its two nuclei being shed with the first moult. The changes in shape and structure are noted and measured.

" The buccal cavity is formed from the cephalic space of the microfilaria, the oesophagus from the nuclei of the anterior part of the nuclear column, the mid-intestine from the nuclei of the middle part of the nuclear column corresponding to the position of the Innen-körper, and the rectum and the anus are developed from the four G cells of Rodenwaldt and the anal pore. The Genitalanlage of Looss or the premature genital mass is probably derived from some nuclei at the neighbourhood of the Innen-körper, and not from any of the G cells as stated by previous workers. The structures found at the sides of the anterior part of the oesophagus near the buccal cavity and those at the posterior part of the rectum near the anus of the mature larva are probably developed respectively from the Mund- and Schwanzgebilde. The muscles of the body wall of the mature larvae are formed from the so-called " subcuticular cells " of Rodenwaldt. The nerve ring and the excretory pore correspond to the same structures of the mature larva." *C. L.*

AUGUSTINE (Donald L.), FIELD (Madeleine E.) & DRINKER (Cecil K.). **Observations on Living *Microfilaria immitis* in the Capillary Circulation of Bats.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 231–232.

These observations make clear how it is that microfilariae are not necessarily causes of capillary emboli.

They were made on the uninjured wing membrane of small brown bats weighing about 6 grams. After anaesthetization by intraperitoneal injection of nembutal, a concentrated suspension of *Mf. immitis* in 0·3 cc. of normal salt solution was given into a vein. Microfilariae were seen at once in capillaries. Within them active migration was conspicuous. Even in the arterioles their movements may be against the blood stream, the microfilariae " making slow progress by bracing themselves through the crests of the alternate undulations of their bodies against the walls of the vessel." When they came to a capillary too small for them " they never were observed to escape or make permanent plugs. They simply backed out." These observations were put through on normal capillaries so are valid proof of what takes place with unsheathed larvae in normal conditions. [It is to be hoped that these workers will have the opportunity to repeat these experiments with the sheathed *Mf. bancrofti*.] *C. L.*

LINDBERG (K.). Draconculose en Iran. [**Prevalence of Dracunculosis in Iran.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Aug. Vol. 40. No. 8. pp. 330–342. With 5 figs. [31 refs.]

Lindberg estimates that the population of Lai is 8,000 to 13,000 and that 1,000 to 5,000 persons suffer yearly from dracunculosis.

The endemic area seems to take up about the lower half of the north-east coast of the Persian Gulf. He believes that *Mesocyclops iranicus* n. sp. is the larval host, but has never seen infection in it, and has seemingly not tried to infect it himself. *C. L.*

MOORTHY (V. N.) & SWEET (W. C.). **A Note on the Experimental Infection of Dogs with Dracontiasis.**—*Indian Med. Gaz.* 1936. Aug. Vol. 71. No. 8. pp. 437–442. With 8 figs.

Male and female worms were found in the tissues of dogs to which had been fed infected cyclops or embryos got from them.

The investigation is in two parts. A dog from a non-endemic region was fed repeatedly in an endemic area during May, 1935, with a total of 123 infected cyclops and fully developed larvae released from 40 more. The cyclops had themselves been infected by larvae got from man by spraying newly opened guineaworm blisters with ethyl chloride. The dog's highest eosinophil count before the infective feed was 19·3 per cent., and after it 35 per cent., in August ; and that month digestive troubles and pustular eruptions were present. On 20th April, 1936, 350 days after the first and 331 days after the last infective feed the dog was restless, off its food, with a rectal temperature of 104°F. with a pea-sized blister above the paw of the left hind foot. When opened and sprayed with ethyl chloride embryos came away. Other worms showed themselves as follows :—April 27th in left front foot, April 29th proximal third of right thigh, April 29th left side of scrotum. Two more tumours were present on the left thigh and chest. The larvae obtained from the worms in the dog were many fewer than

from man but they and the worms could not be distinguished from those got from man. A control dog had no infection.

A series of 28 pups was fed on infected cyclops or had the embryos injected subcutaneously. One to 4 months after the first infective feed all pups became ill with digestive disturbances and pustular skin eruptions; 24 of them died in 2 to 5 months, usually with nervous symptoms or in convulsions, but since 1 of the 2 controls died in the same way the connexion of these symptoms with the infection is at present held doubtful. Autopsies were done on all 28, but only on the last 4 was anything significant found (see table) it being felt on looking back that these negative results may well have been due to lack of knowledge as to where and how to search.

Nematode worms found post-mortem in four dogs previously given feedings of guinea-worm larvae.

	Dog No. 19	Dog No. 20	Dog No. 21	Dog No. 28
Number of female worms ...	1	74	18	44
Number of male worms ...	5	17	7	7
Where found ...	Retro-oesophageal; beneath right scapula.	Right orbit; meninges; retro-oesophageal; thorax; abdominal wall, peritoneal cavity; extremities.	Scalp; retro-oesophageal; thoracic wall; abdominal wall; extremities.	Retro-oesophageal; thoracic wall; extremities.
Total number of infected cyclops and fully-developed embryos fed to dog	150	140	132	88
Number of days between last infective feed and death ...	105	115	144	67
Age at time of infection ...	1½ months	3 months	2½ months	2 months

The worms found were of either sex; in the first 3 dogs the females were 7 to 49 cm. long, the males had a maximum breadth of 2·4 cm. with a breadth of 0·7 mm. In the fourth dog, the worms, obviously immature, were at the most 2·4 cm. long.

The descriptions are not easy to follow but the worms had a definite head with, it seems, a pair of large lateral papillae and a pair of subventral and of subdorsal papillae on the head, and a pair of cervical papillae. The tail of the male is curved in a spiral. Of the two spicules it is said " the left ventral spicule averages, in 3 specimens, 0·55 mm. in length, and the right dorsal 0·53 mm. [The microphotograph suggests to the reviewer a short stout spicule running forward to half way round the first coil and a long thin one running forward to about half way round the second, when the tips of both are at the cloacal opening.] *C. L.*

NÁJERA ANGULO (L.). La *Onchocerca volvulus* en Fernando Poo. [*O. volvulus* **in Fernando Po.**]—*Primer Congr. Nac. Sanidad 1934, Actas* 4. pp. 241–293. With 13 figs. [8 pages of refs.] 1935. Madrid. [Summarized in *Rev. Applied Entom.* Ser. B. 1936. Sept. Vol. 24. Pt. 9. p. 213.]

" From July 1929 to January 1930 the author found cysts of *Onchocerca volvulus* in 121 (19·11 per cent.) of 633 natives examined on the island of Fernando Po. In view of the probable part played by *Simulium damnosum*, Theo., as a vector of *O. volvulus* in Sierra Leone, over 100 flies of this species caught in Fernando Po were dissected, but microfilariae of *O. volvulus* were found in one only. A negative result was obtained with 25 examples of this Simuliid that were fed on natives harbouring cysts of *O. volvulus*."

KOFOID (Charles A.) & WILLIAMS (Owen L.). **The Nematode** *Thelazia californiensis* **as a Parasite of the Eye of Man in California.**—Reprinted from *Arch. Ophthalm.* 1935. Feb. Vol. 13. pp. 176–180. With 5 figs.

The first case of infection by Thelazia in man in America and the first report of *Thelazia californiensis* in man.

Eight years ago a doctor felt an irritation in the right eye. When 2 per cent. butyn solution was dropped in, three actively moving worms came into sight, which proved to be a male and two female specimens of *Th. californiensis*. Measurements: male 10·26 mm. females 13·25 and 11·44 mm. long, by 0·25, 0·294 and 0·325 in greatest diameter. The anatomy is detailed and figured and so are the points which are relied on to separate *Th. californiensis* from *Th. callipaeda*. As is pointed out, the life-history of the genus is unknown; but 10 days before irritation came on, some flying insect got into his right eye. *C. L.*

JOHNSTON (T. Harvey). **A Note on the Occurrence of the Nematode** *Gongylonema pulchrum* **in Man in New Zealand.**—*New Zealand Med. Jl.* 1936. June. Vol. 35. No. 187. pp. 172–176. [15 refs.]

The eighth record, it is believed, of *Gongylonema pulchrum* in man. The worm presented on the lower lip of a young Jugoslav, who had gone back from New Zealand to Jugoslavia for a visit two years ago. It was extracted there in Auckland and sent to and identified by Professor T. Harvey JOHNSTON of Adelaide; and was a fertilized female 58 mm. long. The male has not shown itself. There is a short description of the other cases in man. *C. L.*

OGURA (Katsuchiyo). **Parasite Eggs and** *Endamoeba histolytica* **retained under Finger Nails of School Children in Keijo, Chosen.**—*Jl. Public Health Assoc. Japan.* 1936. July. Vol. 12. No. 7. pp. 1–4.

Examinations of the paring of dirty finger nails, 0·5 to 3 mm. long, of 300 children showed these helminth eggs: Ascaris 6, trichuris 7, enterobius 1, tapeworm 21, paragonimus 1. In one trichuris egg a larva had formed, and one ascaris egg had got as far as the morula. No parasitic protozoa were found. *C. L.*

PIERI (J.) & BOUET. Ictère par anguillulose rebelle. Guérison par instillations duodénales de térébenthine colloïdale.—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 513–516.

GALLIARD (Henri). Sur un cas mortel d'anguillulose observé à Hanoi.—*Bull. Soc. Méd.-Chirurg. Indochine.* 1936. Mar. Vol. 14. No. 3. pp. 335–339. [10 refs.]

MAPLESTONE (P. A.) & BHADURI (V. N.). **Cholera and Intestinal Helminths.**—*Indian Med. Gaz.* 1936. Aug. Vol. 71. No. 8. pp. 449–450.

Cholera has very little if any effect in ridding a person of helminth infections.

Stool samples from 100 cholera cases were examined by D.C.F. for as many days (2 to 14) as the persons were in hospital. At the start 95 cases had hookworm infection and at the finish 91. The corresponding figures for ascaris were 26 and 24, and for trichuris 27 and 24.

C. L.

BACIGALUPO (Juan). Sobre la presencia accidental de huevos de helmintos en las materias fecales humanas. Su significación clínica. Su diagnóstico.—*Rev. Parasit., Clin. y. Lab.* Habana. 1936. May–June, Vol. 2. No. 3. pp. 267–276. With 6 figs. on 1 plate. [10 refs.] English summary.

JOYEUX (Ch.) Recherches helminthologiques dans la région de Marseille. —*Rev. Parasit., Clin. y. Lab.* Habana. 1936. May–June. Vol. 2. No. 3. pp. 413–419. English summary.

GIOVANNOLA (Arnaldo). **Energy and Food Reserves in the Development of Nematodes.**—*Jl. Parasitology.* 1936. Apr. Vol. 22. No. 2. pp. 207–218. With 8 figs & 1 diagram. [15 refs.]

"The substances stored in the nematodes have been distinguished as energy reserves and food reserves. The glycogen is found essentially in those stages that precede a rapid and intense development and has been considered as an energy reserve. The fat is found essentially in those stages that precede a period of less nutrition or of fasting, or in complete sexually developed stages and has been considered a food reserve."

C. L.

ANDREWS (John S.). **Note on the Egg Producing Capacity of** *Cooperia curticei*, **a Nematode Parasitic in Sheep.**—*Jl. Parasitology.* 1936. Apr. Vol. 22. No. 2. pp. 222–223.

In yet another nematode infection it is found that as the worm load increases the number of eggs posited per female worm lessens. [More evidence that the crude estimation of worm loads by egg counts has no exactitude and no scientific basis.] *C. L.*

CHANDLER (Asa C.). Studies on the Nature of Immunity to Intestinal Helminths. IV. The Inter-Relations between Parenteral and Intestinal Immunity in Rats Infected with Nippostrongylus.—*Amer. Jl. Hyg.* 1936. July. Vol. 24. No. 1. pp. 129–144. [13 refs.]

RADHAKRISHNA RAO (M. V.). Cirrhosis of the Liver following Chronic Intoxication with Carbon Tetrachloride: an Experimental Study.—*Indian Jl. Med. Res.* 1936. Apr. Vol. 23. No. 4. pp. 1007–1014. With 8 figs. on 2 plates. [16 refs.]

CAWSTON (F. Gordon). Tartar Emetic and Sodium Antimonyltartrate.—Reprinted from *Pharmaceutical Jl.* 1935. Sept. 7. 1 p.

LEISHMANIASIS.

ARCHIBALD (Robert). **Interim Report on Kala-Azar Investigations.**—*Rep. Sudan Med. Service for Year 1935.* p. 65.

This report is a catalogue of certain results of the kala azar investigation in the Sudan. From the point of view of insect transmission the peripheral blood of 31 cases was examined for leishmania with the discovery of parasites in two of the cases. Nasal swabs from 22 cases revealed parasites in 7 cases, in two of which the infection was heavy. No parasites were found in the faeces, urine or conjunctival secretion, nor in the viscera of dogs, cats or other animals ; nor in wild sandflies, lice and bed-bugs taken in kala azar huts. It is concluded that the available data strongly suggest contact infection. As regards animal experiments it is noted that grey monkeys are susceptible to subcutaneous inoculation and that leishmania may appear in the nose, as judged by nasal swabs, within 21 days after intraperitoneal inoculation. Grey monkeys have been infected by nasal swabbing and spraying with infective material. Two of five healthy monkeys contracted infection when confined in an insect-proof room with five experimentally infected monkeys. *C. M. Wenyon.*

MAYER (Martin) & MALAMOS (Bas.). Experimentelle Beiträge zur Leishmanioseforschung. [**Experimental Contribution to the Study of Leishmaniasis.**]—*Arch. f. Dermat. u. Syph.* 1936. Vol. 174. No. 3. pp. 225–250. With 21 figs. [29 refs.]

This paper gives an account of studies of oriental sore and kala azar in Canea in Crete, where the diseases have already been reported upon by PAPANTONAKIS (this *Bulletin*, 1936, Vol. 33, p. 17). As was noted by this observer, oriental sore occurs in the old Turkish quarter of the town where the houses are crowded into narrow streets, while kala azar in human beings and dogs is found only on the newer periphery of the town where the houses are separated from one another by open spaces. The general features of these diseases are the same as have been described from other endemic foci. Of special interest is the study of kala azar in dogs and the confirmation of the statements that have been made regarding the tendency to cutaneous ulceration and the general distribution of leishmania throughout the skin of the body, sections of perfectly healthy skin, as judged by its appearance, showing nests or collections of parasites in large numbers. As regards pathological changes in dogs there appears to be little relationship between the intensity of infection and the degree of change. The formol-gel test was carried out on the serum of over 600 dogs with a positive result in 42, of which only 33 per cent. were proved to be infected. Conversely, known infected dogs do not all give a positive reaction. A number of cases of kala azar and oriental sore, mostly recovered cases, were tested for a skin reaction by intracutaneous injection of antigens of killed flagellates from surface cultures. Of 23 oriental sore cases tested with *Leishmania tropica* antigen 18 gave a positive reaction. Of 12 of these cases tested with *L. donovani* antigen 6 were positive. Of 3 early cases of kala azar tested with both antigens not one was positive, whereas of 31 recovered cases 17 were positive with *L. donovani* antigen while of 12 of these tested with *L. tropica* antigen 7 were positive. As regards transmission of the disease it was noted that of sandflies in the

oriental sore area only *Phlebotomus sergenti* and *P. papatasi* occurred, while the recognized vectors of kala azar, *P. major* and *P. perniciosus*, were absent. The two last, however, were present in the peripheral areas of the town where kala azar occurs. For the prevention of the disease it does not seem possible to carry out measures against the sandflies. Reliance will have to be placed on early diagnosis of cases and the destruction of sick dogs, which at present continue to live in close association with their owners. *C. M. W.*

PAPANDONAKIS (Evangelos). Observations sur les leishmanioses dans la Préfecture de la Canée (Ile de Crète). [**Leishmaniasis in the Prefecture of Canea, Crete.**]—*Bull. Office Internat. d'Hyg. Publique.* 1936. May. Vol. 28. No. 5. pp. 852–860. With 1 map, 3 diagrams, 1 plan & 1 plate.

A short account of kala azar and oriental sore in Canea, Crete, similar to that previously published (this *Bulletin*, 1936, Vol. 33, p. 17). *C. M. W.*

GIRAUD (Paul) & CAILLOL. Trois cas de kala-azar observés à plusieurs années d'intervalle dans la même famille. [**Three Cases of Kala Azar in One Family at Long Intervals.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1936. June 22. 52nd Year. 3rd Ser. No. 21. pp. 997–1000.

The paper describes an instance of family infection in kala azar in which three children of a family living in a surburb of Marseilles in a house on the dry hill-side contracted the disease—the first child in 1929 at two years of age, the second in 1932 at three years of age, and the third in 1936 at four years of age. During this time two other children in neighbouring houses were found to have kala azar. It is pointed out that sandflies and mosquitoes were little evident in the district but that dog ticks were abundant. That the ticks bit the children is evidenced by the fact that the first child suffered from *fièvre boutonneuse* during the year preceding that in which it fell ill with kala azar. *C. M. W.*

DU (S. D.) & BEST (A. E.). **Kala-Azar in West China.**—*Chinese Med. Jl.* 1936. Mar. Vol. 50. No. 3. pp. 273–277. With 2 figs.

The presence of kala azar in Western China has been suspected for some time but no case proved by proper diagnosis has been reported. The case noted in this paper is one in which leishmania were demonstrated by spleen puncture. The patient was a military officer 31 years of age who without doubt contracted the disease in the north of Szechwan or in an adjacent area of Kanso. *C. M W.*

YOSEZATO (M.). **On the Distribution of Kala-Azar in the District of the Mukden-Shanhaikwan Line in Manchoukuo.**—*Jl. Oriental Med.* 1936. Aug. Vol. 25. No. 2. [In Japanese pp. 235–237. With 1 map. English summary p. 36.]

The survey carried out has indicated that kala azar extends further west than Mukden not only to Shankhaikwan but also northward into the Jeho district. *C. M. W.*

RAMIREZ (Bernardo). Un caso de kala-azar asociado a fiebre recurrente y con gran cantidad de leishmanias en sangre periférica. [**A Case of Kala Azar associated with Recurrent Fever and the Presence of Leishmania in Large Numbers in the Peripheral Blood.**]—*Medicina Países Cálidos.* Madrid. 1936. Aug.–Sept. Vol. 9. Nos. 8 & 9. pp. 406–407.

In 1931 a child one year of age from Guarromán in Spain was diagnosed as a case of kala azar by the discovery of leishmania in the peripheral blood (a single parasite) and in material from spleen puncture (many parasites). Successful treatment with neostibosan was carried out. Three years later the same child was brought to the malaria clinic suffering from fever and other symptoms. A thick blood film made for the purpose of malarial diagnosis revealed an enormous number of leishmania and also spirochaetes of relapsing fever. A cure was brought about by neostibosan treatment. *C. M. W.*

HU (C. H.). **The Pathological Anatomy of Human Kala-Azar with Special Reference to Certain Hitherto Less Well Recognized Changes.** —*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 1–12. With 12 figs. on 3 plates. [15 refs.]

During the post-mortem study of 31 cases of kala azar it became evident that certain pathological changes had not been sufficiently emphasized by previous workers. Though the increase in the reticulo-endothelial system is the most important and characteristic result of infection with leishmania other changes also occur. Frequently there is an extra-medullary formation of myeloid tissue on the dural surface of the skull with secondary growth of new bone on the inner surface. In the bone marrow there is a myelocytic hyperplasia which is often strikingly noticeable after the parasites and their containing cells have disappeared. There is an increase of the young myeloid cells, while the metamyelocytes and leucocytes are decreased in number; the normoblasts are in most cases either not greatly increased or probably decreased. In the spleen and bone marrow there is an increase of plasma cells which may persist for a considerable time after the disappearance of the parasitized cells. *C. M. W.*

MOCHKOVSKI (Ch.). Quelques observations sur la coloration vitale des Leishmania. [**Vital Staining of Leishmania.**]—*C. R. Soc. Biol.* 1936. Vol. 121. No. 15. pp. 1607–1608.

Culture forms of leishmania taken from the surface of a medium and suspended in physiological saline solution may be vitally stained by placing a drop of the fluid on a slide on which an alcoholic solution of brilliant-cresyl blue has been allowed to evaporate. After staining, the flagellates in the fluid are exposed to the vapour of osmic acid and then spread into a film and dried. The film is then stained by Romanowsky stain. The nucleus is seen to have a violet red margin of chromatin and a blue central karyosome. In the cytoplasm are masses of a substance resembling the crinome of Chlopin. Between the masses the pellicle stained a violet red colour is seen. It is concluded that the masses consist of a substance which in life is uniformly distributed through the cytoplasm and that having a negative charge it is flocculated by the basic dye. This phenomenon is compared with the flocculation which occurs in polychromatophile erythrocytes.

C. M. W.

NATTAN-LARRIER (L.) & GRIMARD (L.). Existe-t-il des formes métacycliques dans les cultures de *Leishmania donovani*? [**Do Metacyclic Forms exist in Cultures of** *L. donovani*?]—*C. R. Soc. Biol.* 1936. Vol. 122. No. 24. pp. 993–996.

In following the development of *Leishmania donovani* in *Phlebotomus perniciosus* ADLER and THEODOR noted that the flagellates occurring in the proboscis were sometimes smaller than those which multiplied actively in the stomach. It was thought that these short flagellates might represent the metacyclic infecting forms. The authors of the paper under review have noted that similar dwarf forms 5–8 μ in length are liable to occur in old cultures, and they again suggest that they may be metacyclic forms, and point out that in cultures of *Trypanosoma lewisi* and *T. rabinowitschi* metacyclic trypanosomes are known to appear as the culture becomes old. *C. M. W.*

MAYER (Martin) & MALAMOS (B.). Zur Differentialdiagnose von *Leishmania donovani* und *tropica* durch Plattenkulturen. [**Differential Diagnosis of** *Leishmania donovani* **and** *L. tropica* **by Plate Cultures.**]—*Zent. f. Bakt.* I. Abt. Orig. 1936. June 12. Vol. 136. No. 7/8. pp. 412–418. With 6 figs.

Cultures of leishmania of oriental sore and kala azar can be differentiated by the type of growth on blood-agar plates (Nöller's medium). In the case of *Leishmania tropica* a streak inoculation gives in the course of a few weeks a growth which is characterized by off-shoots, sometimes branched, from the main streak, while *L. donovani* gives a simple streak without side outgrowths. These differences are shown by a number of different strains, some of which have been maintained in culture or in animal passages for a number of years. The parasite of S. American leishmaniasis resembles that of oriental sore. It is noteworthy that a strain of *L. tropica* which has been carried on through a number of passages in mice as a generalized infection resembling kala azar gave a growth like that of *L. donovani* of kala azar. *C. M. W.*

CHUNG (Huei-Lan). **Studies on the Resistance of Leishman-Donovan Bodies to Various Physical, Chemical, and Biological Agents. Part I. The Resistance of Leishman-Donovan Bodies to Certain Physical Agents, namely, X-Ray, Heating, Chilling and Drying.**—*Chinese Med. Jl.* 1936. Aug. Vol. 50. No. 8. pp. 1039–1050. [22 refs.]

The influence of various factors on *Leishmania donovani* as it occurs in the liver and spleen of experimentally infected hamsters was investigated by exposing the organs or an emulsion of the organs to these factors and then injecting the material intraperitoneally into hamsters. An emulsion after exposure to X-rays in doses of ½ or 50 per cent. S.E.D. to 2 or 200 per cent. S.E.D., still infected hamsters [100 per cent. S.E.D. = one full skin erythema dose]. Heating to 40°C. to 43°C. for at least 30 minutes did not kill the leishmania, whereas a temperature of 44°C. did do so. The leishmania in liver were still viable after 72 hours at 5°C., but after 43 days' exposure to this temperature the leishmania had been killed. Suspended in normal saline solution they remained alive for eight days at 5°C. but were killed after 14 to 19 days. They withstood a 48 hour exposure to a temperature of 25°C. below zero. Drying in smears on a Petri dish for 1½ hours killed the leishmania. *C. M. W.*

DUBOIS (A.). Utilisation des glucides par *Leishmania tropica.* [**Utilization of Sugars by** *Leishmania tropica.*]—*C. R. Soc. Biol.* 1936. Vol. 123. No. 26. pp. 141–144.

The author has tested the action of various sugars on the culture forms of leishmania by washing them in Ringer's solution and adding to a Ringer solution suspension of the flagellates solutions of sugars to give a strength in the final liquid of 0·2 per cent. At intervals after this the flagellates are examined for increase or decrease in numbers or for loss or increase in motility. The sugars which definitely activate the flagellates are glucose, levulose, mannose, galactose, saccharose, raffinose, inulin and glycerine. Maltose and dextrin were uncertain in action while without action were mannite, adonite, sorbite, dulcite, amygdalin, arabinose, salicine, lactose, inosite, isodulcite, xylose and glycogen. Washed flagellates which have become immobile in Ringer's solution after a few hours may be revived by the addition of certain sugars, such as glucose, mannose, levulose, galactose, inulin and glycerine. Other sugars lack this activating power. *C. M. W.*

SUN (C. Jung), YAO (Y. T.), CHU (H. J.) & WU (C. C.). **Natural Infection of** *Phlebotomus chinensis* **with Flagellates Morphologically Indistinguishable from those of** *Leishmania donovani.*—*Chinese Med. Jl.* 1936. July. Vol. 50. No. 7. pp. 911–916. With 5 figs. & 1 sketch map. [25 refs.]

The village of Wang Shih Koo Chuang is situated about 12 miles from Tsing Kiang Pu, a famous city on the bank of Grand Canal in North Kiangsu, China. It has a population of 237 persons living in 39 houses. In June 1935 there were found here 46 cases of kala azar distributed in 31 of the 39 houses. Between June 6 and July 16, 1935, there were collected 769 sandflies, of which 684 were females and 85 males. The majority were *Phlebotomus chinensis* and the rest *P. sergenti* var. *mongolensis*, *P. squamirostris* and *P.* sp. Of the female *P. chinensis* 421 caught in kala azar houses were dissected, with the result that in seven were found flagellates indistinguishable from the developmental forms of *Leishmania donovani* seen in *P. chinensis* fed experimentally on kala azar patients. In 26 of the sandflies O-shaped bodies, regarded as rounded forms of the flagellates, were found in the intestine. This record of naturally occurring sandfly infection is the first from China and brings the sandfly transmission problem in China into line with observations which have been made in India and elsewhere.

C. M. W.

SMITH (R. O. A.), LAL (Chiranji), MUKERJEE (S.) & HALDER (K. C.). **The Transmission of** *L. donovani* **by the Bite of the Sandfly** *P. argentipes.*—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 313–316.

This note records another, the fourth, success which has attended efforts to transmit kala azar to an animal by the bite of the sandfly *Phlebotomus argentipes*. The hamster (*Cricetulus griseus*) which became infected was one of 16, each of which on an average was subjected to 10 feeds by infected sandflies. The infection was detected when the animal was sacrificed 17 months later. *C. M. W.*

ESTRADA (A.). Les leishmanies peuvent se multiplier par schizogonie. [**Leishmania can multiply by Schizogony.**]—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 722–726. With 1 fig.

In view of the publication by NATTAN-LARRIER and GRIMARD (this *Bulletin*, 1935, Vol. 32, p. 485) on the possibility of schizogony as a method of multiplication of leishmania, the author is led to record observations she had made on leishmania in smears of the spleen of a case of kala azar and on the culture forms of these organisms. She believes that she also has obtained multinuclear forms which she interprets as evidence of schizogony. *C. M. W.*

TENG (Chia-Tung) & FORKNER (Claude E.). **The Presence of Infective** *Leishmania donovani* **in the Urine and Prostatic Fluid of Patients with Kala-Azar.**—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 394–401. [16 refs.]

The intraperitoneal inoculation of the urinary sediment from 3 of 13 cases of kala azar and prostatic secretion from one of two cases gave rise to infection with *Leishmania donovani* in Chinese hamsters.

C. M. W.

TENG (Chia-Tung). **Negative Effect on Blood of Normal Rabbits of Inoculation of Killed** *Leishmania donovani.*—*Proc. Soc. Experim. Biol. & Med.* 1936. June. Vol. 34. No. 5. pp. 661–665. With 1 chart.

Repeated injection into rabbits of killed cultures of *Leishmania donovani* failed to reproduce the leucopenia which is such a characteristic feature of kala azar. A temporary fall in the number of leucocytes followed the inoculations but the normal condition was quickly restored.

C. M. W.

LESTOQUARD (F.) & DONATIEN (A.). Etude des *Leishmania* du derme cutané [**Examination of the Dermis for** *Leishmania.*]—*Bull. Soc. Path. Exot.* 1936. Apr. 1. Vol. 29. No. 4. pp. 422–430. With 25 figs.

In this article the authors discuss the recently introduced method for the diagnosis of kala azar by making films from scrapings of the dermis. Though they have already reported considerable success with this method, others who have attempted it have been less satisfied with the results. Accordingly they now refer to the difficulties which may be encountered and describe the technique to be adopted. In the first place the parasites in the skin may show certain abnormalities of form and size, there being less uniformity than is the case with the parasites seen in the usual smears from the internal organs. In the second place in obtaining films from the skin it is essential that as little blood as possible be obtained. The skin can be scarified with a vaccinostyle to the depth of the dermis in which occur the monocytes containing parasites. With some practice, material for film-making can be obtained with very little blood. Another method is to excise a wedge-shaped piece of skin of the right depth. The dermal edge of the piece of skin is then smeared on a slide. It is well not to make too large a smear so as to permit complete examination of the entire film after staining by the

usual method. This method has been practised for over a year at the Institut Pasteur d'Algérie for the diagnosis of human as well as canine cases, and the authors are convinced that it is an indispensable method for the discovery of leishmania. In 33 cases films made from dogs and sent to the institute from a distance gave positive findings.

C. M. W.

GIRAUD (P.), CIAUDO (P.) & BERNARD (R.). La séro-réaction au peptonate de fer ; son utilisation dans le diagnostic de la leishmaniose interne. [**The Peptonate of Iron Test for Kala Azar.**]—*Marseille-Méd.* 1936. Mar. 15. Vol. 73. No. 8. pp. 355–371. [14 refs.]

The paper gives a description of a careful study of the peptonate of iron (Merck) test for kala azar, the test being positive when a definite flocculation is given on adding the reagent to the serum. The outcome of the work is that the authors are convinced that the test, which can be applied to the small quantity of serum obtainable from a finger-prick, is of definite value in the diagnosis of kala azar. It is admitted that a comparison has not been made with all the other serological tests employed in this disease. *C. M. W.*

SÁNCHEZ BOTIJA (C.). Leishmaniosis canina. Algunas observaciones sobre los caracteres generales del foco endémico en Madrid. [**Canine Leishmaniasis. Observations on the General Characters of the Endemic Focus in Madrid.**]—*Rev. Hig. e San. Pecuarias.* 1936. Mar. Vol. 26. No. 3. pp. 148–158.

During the year January 1935 to February 1936 amongst 2,230 dogs examined in Madrid 178, or 7·9 per cent., were found to be suffering from leishmaniasis. The cases were most common in the autumn. In 64 of a series of 128 infected dogs cutaneous lesions were present. These lesions were visible macroscopically in 78 per cent. of the 64 but visible only microscopically in the remaining 22 per cent. The diagnosis of the condition in dogs is discussed and it is concluded that reliance has to be placed on the clinical evidence and the examination of excised skin, especially that from the cutaneous lesions. Serological tests may be of assistance but they are not reliable enough for making conclusions as to the incidence of the disease. *C. M. W.*

BOZZELLI (Roberto). Su alcuni casi di leishmaniosi viscerale del cane osservati in Messina. [**Some Cases of Canine Kala Azar observed in Messina.**]—*Riv. Sanitaria Siciliana.* 1936. Aug. 15. Vol. 24. No. 16. pp. 869–874.

In this paper the author discusses some general problems connected with canine leishmaniasis in Messina and other places. Is canine kala azar caused by the same parasite as that producing the human disease ; is the dog to be regarded as a reservoir of the human virus ; why is it that though both oriental sore and kala azar occur in Sicily no cases of the former disease are seen in dogs, or is it possible that this disease in dogs is associated with a generalized infection, just as kala azar in these animals is frequently associated with cutaneous lesions ? These and other questions are discussed without arriving at any definite conclusions, though from the point of view of diagnosis of kala azar in dogs the clinical features are considered in some detail. *C. M. W.*

YAO (Y. T.) & SUN (C. Jung). **Dermal Leishmaniasis in China.**—*Indian Med. Gaz.* 1936. Sept. Vol. 71. No. 9. pp. 519–520. With 3 figs.

The condition known as post-kala-azar dermal leishmaniasis, which is of fairly common occurrence in India, has not hitherto been recorded from other kala azar areas. The authors, who have been on the look out for this condition in China, now report three cases in which multiple depigmented areas were present over the body. In no case was there ulceration or nodule formation. Leishmania were demonstrated by culture method in the lesions of one of the cases, all of which had previously been treated for kala azar. *C. M. W.*

VILLAIN (Georges), MARINI (Charles) & BELFORT (Joseph). Leishmaniose cutanée. [**Cutaneous Leishmaniasis.**]—*Tunisie Méd.* 1936. June. Vol. 30. No. 6. pp. 244–247.

The record of the case of a young man 19 years of age who developed a number of oriental sores after exposing himself to the bites of sandflies when sleeping in the open in Tunis. The first sore appeared on the back of a finger in about a fortnight, another developed on the leg five days later, while, subsequently, others appeared on the leg. Treatment consisted of applications of synectol, which appears to be a product of local plants made up in lanoline and cocoa butter, to some sores, and of anthiomaline, an antimony preparation, to others. The best results were obtained with synectol. *C. M. W.*

CLASTRIER (J.). Sur un cas de bouton d'Orient observé dans l'Aurès (département de Constantine). [**Case of Oriental Sore in the Aures, Algeria.**]—*Arch. Inst. Pasteur d'Algérie.* 1936. June. Vol. 14. No. 2. pp. 135–136.

In the department of Constantine (Algeria) oriental sore is known to occur all along the western border of the Aures mountains. The paper records the first case from the interior of the mountainous regions. It came from the valley of Oued el Abiodh, 720 metres above sea level.

C. M. W.

CORRADETTI (Augusto). Ricerche sui flebotomi della zona endemica di leishmaniosi cutanea in Abruzzo. [**Sandflies of the Endemic Oriental Sore Zone of the Abruzzi.**]—*Ann. d'Igiene.* 1936. Jan. Vol. 46. No. 1. pp. 13–17.

In endemic centres of oriental sore in Eastern Italy 486 sandflies (*Phlebotomus macedonicus*) captured in houses with cases of oriental sore were dissected without any evidence of leishmania infection being found. Of 51 sandflies taken in stables 5·09 per cent. contained human blood, while of 83 captured in houses 98·79 per cent. contained human blood. It would appear, therefore, that this sandfly shows little tendency to leave the place where it has obtained its meal of blood.

C. M. W.

CAMINOPETROS (J.). Reproduction de la leishmaniose cutanée humaine chez le spermophile *Citillus citillus*. [**Reproduction of Human Oriental Sore in the Spermophile.**]—*C. R. Soc. Biol.* 1936. Vol. 122. No. 16. pp. 45–47.

It is known that the inoculation of hamsters with *Leishmania tropica*, either subcutaneously or intraperitoneally, is often followed by a generalized visceral infection. In mice a generalized infection seems to be even more easily produced by intraperitoneal injection of *L. tropica* than of *L. donovani*. In the case of the spermophile (*Citillus citillus*) subcutaneous or intracutaneous injections of cultures of *L. tropica* or parasites taken from an oriental sore itself give rise to cutaneous lesions only, while intraperitoneal injections are never followed by cutaneous lesions. Thus inoculation into or under the skin of the sacral region gives rise in two or three months to a nodule covered with a dry crust. This increases in size for about a year and resembles very closely an oriental sore in man. Meanwhile the skin in the region of the joints of the hind limbs becomes swollen and copper-coloured while small nodules may appear on the skin of the tibio-tarsal region. In the damaged tissues leishmania can be found. Many of the parasites are peculiar giant forms. After about a year the infection retrogresses, but at no time is it possible to demonstrate a visceral infection. Animals which have been subjected to a previous subcutaneous, subconjunctival or intraperitoneal injection are in an allergic state and more sensitive to cutaneous reinoculation. *C. M. W.*

NATTAN-LARRIER (L.) & NOYER (B.). Les infections de la souris par *Leishmania tropica*. [**Infections of Mice with** *Leishmania tropica*.]—*C. R. Soc. Biol.* 1936. Vol. 122. No. 23. pp. 902–904.

—— & ——. Le tropisme de *Leishmania tropica* chez la souris. [**Tropism of** *Leishmania tropica* **in the Mouse.**]—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 769–777.

From a series of experimental inoculations made in mice with a strain of *Leishmania tropica* received from the Hamburg Institute of Tropical Diseases the authors are led to the conclusion that, as regards their tendency to give rise to cutaneous lesions, generalized infections or involvement of the testes, strains vary considerably. The Hamburg strain inoculated into the skin at the base of the tail gave rise to a cutaneous lesion associated not infrequently with the presence of parasites in the liver and spleen. Inoculated intraperitoneally, a local intraperitoneal infection was produced associated with involvement of the liver and spleen, which occasionally showed large numbers of parasites as in kala azar. Very rarely testicular involvement occurred. The results are compared with those obtained by other authors in similar experiments. *C. M. W.*

MARKIANOS (J.). Un cas de bouton d'Orient datant de cinq ans. [**Oriental Sore lasting 5 Years.**]—*Bull. Soc. Path. Exot.* 1936. June 10. Vol. 29. No. 6. pp. 678–679.

Though oriental sore is generally recognized as a self-curing infection, sores beginning to heal spontaneously in about a year, this is far from being the general rule in Crete, where sores of two or three years' duration are quite common. The general belief that sores heal in about a

year is held by the people, who accordingly trouble little about attempting to cure the sores, which they think will soon disappear. This dangerous policy leads to various troubles such as case-to-case infections and unnecessary development of the sores and the subsequent scarring. A case is recorded where a sore on the cheek persisted for five years. A cure was obtained in two months by intravenous neostibosan and local applications of powder and solution of permanganate of potash. *C. M. W.*

MONACELLI (Mario). Atipie cliniche e diagnosi biologica della leishmaniosi cutanea. [**Atypical Oriental Sore.**]—*Riforma Med.* 1936. May 23. Vol. 52. No. 21. pp. 707–14, 717. With 8 figs. [17 refs.]

Attention is called to the occurrence in Italy of cases of oriental sore which on account of the unusual character of the lesions are liable to be overlooked. One form is a non-ulcerating lipoid type which, however, can hardly be regarded as atypical in Italy as cases of the kind constitute a fair proportion of all cases seen. True atypical cases are those in which there is a marked exaggeration of what may be called the normal oedema surrounding the sore. In these cases the condition resembles *lupus pernio* or *lupus tumidus.* *C. M. W.*

CIACCIO (Ivan). Contributo alla sierodiagnosi della leishmaniosi cutanea. [**Serodiagnosis of Oriental Sore.**]—*Policlinico.* Sez. Prat. 1936. May 11. Vol. 43. No. 19. pp. 862, 865–6, 869–70, 873–4. [22 refs.]

In 14 cases of oriental sore the author has tested various serological reactions which are employed as an aid to the diagnosis of kala azar. These were the globulin test of Brahmachari, the aldehyde test of Napier, the antimony test of Chopra, and the combined antimony and aldehyde test as introduced by Nattan-Larrier and Grimard-Richard. It is concluded that these tests depend on a lack of colloidal equilibrium caused by a change in the albumin-globulin relationship and that, though not specific, they are suggestive of oriental sore when positive. *C. M. W.*

DRUCKMAN (A.) & DOSTROWSKY (A.). **X-Ray Treatment of Leishmania Cutanea.**—*Harefuah.* 1936. June. Vol. 10. No. 6. [In Hebrew pp. 328–333. English summary pp. 2–3. With 2 figs.]

The report concerns 100 cases of oriental sore treated by X-ray irradiation. No optimal dose could be determined as much depends on the age and character of the sore. For advanced cases 250–300 " R " were used, while for early ones 400–600 " R " were employed. One week after the first exposure inspection of the sore usually revealed a response. If none was noted a second exposure was given and in some cases a third was required. When there is a reaction healing follows without further treatment. Usually all cases were treated with the following factors: 2 mm. Al. Filter, 150 KV., 6mA, and 30 cm. local distance. The irradiation extended over ½ cm. of the surrounding skin. In large sores the central atrophic area was covered with lead

to protect the skin. From experiments carried out by exposing parasites to similar irradiations it was shown that these were not lethal. The treatment evidently stimulates the tissues rather than killing the leishmania. *C. M. W.*

KRASNJANSKIJ (M. W.) & LAWROW (A. P.). Versuch einer Behandlung der Hautleishmaniose mit Gold. [**Gold Treatment of Oriental Sore.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Nov. Vol. 40. No. 11. pp. 518–520.

The authors report that they have had good results in the treatment of oriental sore by intravenous injections of 1/1,000 solutions of "solganol" or potassium gold cyanide. The solganol solution is given in doses varying from 0·5 to 5·0 cc. and the other solution in doses of 0·5 to 3·0 cc. As a rule after two to five injections there is an acute reaction around the sore, while in most cases complete healing has taken place after 10 to 15 injections. *C. M. W.*

PARREIRAS (Decio). Considerações sobre a gangosa e a espundia. [**Gangosa and Espundia.**]—*Folha Med.* 1936. July 25. Vol. 17. No. 21. pp. 368–369. With 2 figs.

In describing a case of extensive ulceration of the skin of the nose, cheeks and lips, with involvement of the naso-pharyngeal mucosa, giving rise to a condition of mutilating rhino-pharyngitis, the author discusses the diagnosis, which he considers might with justification be given as gangosa probably caused by leishmanial invasion—if gangosa be defined as "an ulcerative condition of the palate, nose, pharynx and skin surface"—or as espundia, if this be defined as naso-pharyngeal leishmaniasis. It seems clear from this case that certain tropical skin diseases require a redefinition of the criteria necessary for diagnosis.

C. M. W.

ELIAS (Seraphim). Therapeutica da leishmaniose. [**Therapeutics of Leishmaniasis.**]—*Hospital.* Rio de Janeiro. 1936. Sept. 8th Year. Vol. 2. No. 9. pp. 1011–1017. With 6 figs.

Three cases of cutaneous leishmaniasis in Brazil, of which one had also lesions of the nasal mucosa, were treated successfully with intramuscular injections of fouadin (neo-antimosan). *C. M. W.*

SMITH (R. O. A.), MUKERJEE (S.), HALDER (K. C.) & LAL (Chiranji). **Bionomics of** *P. argentipes.* **Part I. The Duration of Life in Nature. With an Appendix by** K. C. K. E. RAJA.—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 295–311. With 1 graph.

In India *Phlebotomus argentipes*, the sandfly vector of *Leishmania donovani*, becomes infective about the time of its third feed, *i.e.*, in 6½ days after a meal of infecting blood. The determination of the midge's length of life in nature is therefore a matter of practical importance, and in the series of experiments described in the present paper an attempt was made to solve the problem by the method of release and subsequent recapture. Before being set at liberty the insects were marked either by being dusted with finely powdered fluorescin or eosin,

or by the amputation under ether of a middle leg. Unfortunately, except in one case only a small percentage (3·6 for all experiments together) of marked flies was ever recovered, and no appreciable difference in the proportion recaptured was traceable to the method of marking. In all, 3,271 flies were released and 118 were recovered. For this result two species of predacious spiders and also lizards are thought to have been to some extent answerable, and the authors suggest that " one of the factors responsible for an epidemic of kala-azar " may possibly be " an alteration of balance between the insect vectors and their natural enemies."

The appendix supplies data obtained under artificial conditions, and shows that, out of 12,998 laboratory-bred flies which took a first meal of blood, 3,337, of which 236 were known to be infected, lived until the third meal. Thereafter the survivors rapidly diminished in number, and the last three flies expired at the age of from 24 to 26½ days.

E. E. Austen.

TIMPANO (P.). Il metodo di M. Ascoli nella cura della splenomegalia da malaria e da kala-azar.—*Policlinico.* Sez. Prat. 1936. Nov. 9. Vol. 43. No. 45. pp. 2007–2009.

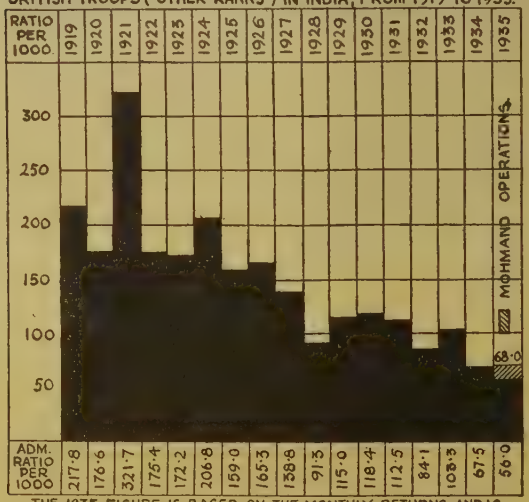
MALARIA.

AMY (A. C.) & BOYD (J. S. K.). **Malaria in India : the Synthetic Drugs and the Relapse Rate.**—*Jl. Roy. Army Med. Corps.* 1936. July & Aug. Vol. 67. Nos. 1 & 2. pp. 1–17 ; 83–95. With 4 graphs.

This study is based on the malaria statistics of the British troops in India, the average annual strength of which approximates 55,000. The number of hospital admissions for malaria has varied between 18,878 in 1921 and 3,676 in 1934. These figures include primary infections and relapses. The decline in admission rates during recent years is shown in the graph reproduced below :—

GRAPH I

A GRAPH SHOWING THE ANNUAL INCIDENCE OF MALARIA (NUMBER OF ADMISSIONS PER 1000 OF STRENGTH) AMONGST BRITISH TROOPS ("OTHER RANKS") IN INDIA, FROM 1919 TO 1935.



THE 1935 FIGURE IS BASED ON THE MONTHLY RETURNS AND IS LIABLE TO BE SLIGHTLY ALTERED BY THE ANNUAL COMPILATION

[Reproduced from the *Journal of the Royal Army Medical Corps.*]

A detailed study of these hospital returns has led the authors to the conclusion that the reduction in malaria incidence during the last few years is largely attributable to a reduction in the number of relapses. Generally speaking most primary attacks of malaria occur in the second half of the year ; most relapses in the first half. It is realized that there are many exceptions to this generalization but it is justified in the main. If the reduction in the relapse rate is a predominant factor in determining the reduction in admission rates, then the hospital admissions for malaria in the first half of the year should form a smaller proportion of the number of admissions during the preceding six months than formerly. This is the case. The admission rate for January to

June expressed as a percentage of the admission rate for the previous July to December was :—

1928–29	1929–30	1930–31	1931–32	1932–33	1933–34	1934–35
31·8	24·7	28·4	24·1	22·9	16·8	16·9

Further evidence of the reduction in the number of relapses is furnished by the experience of the Kasauli Malaria Treatment Centre : this was opened expressly for the treatment of intractable malaria cases. The numbers of cases admitted to this centre were :—1928, 243 ; 1929, 248 ; 1930, 341 ; 1931, 126 ; 1932, 63 ; 1933, 51. Thereafter the Centre was closed for lack of suitable cases to treat.

Fewer relapses might conceivably be the result of a change in the prevailing type of malaria. Of this there is no evidence. A comparable reduction has not been noted among Indian troops. Moreover, malignant tertian cases expressed as percentages of benign tertian cases, though subject to wide fluctuations from year to year, have shown no defined upward or downward tendency.

The decline in the relapse rate runs *pari passu* with the introduction of plasmoquine ; in 1929–30 it was used experimentally in certain selected hospitals. In 1931 a limited quantity was distributed to hospitals. In 1932 it was available for general use but it was given in inadequate doses. In 1933 standard courses of treatment were introduced, quinine and plasmoquine or atebrin and plasmoquine.

As the result of their experience the authors recommend the following standard treatment for British troops in India. The patient is put to bed and purged with calomel followed by Epsom salts. Quinine is then given until initial febrile paroxysms are controlled. Quinine is then stopped and atebrin is given, 0·3 gm. a day for 7 days. The patient is then allowed to get up and receives 0·03 gm. of plasmoquine a day for a further 5 days. *Norman White.*

COVELL (G.) & BAILY (J. D.). **Malaria in Sind. Part XV. The Effects produced by the Operation of the Lloyd Barrage Scheme on the Incidence of Malaria in Sind.**—*Records of the Malaria Survey of India.* 1936. Sept. Vol. 6. No. 3. pp. 387–409. With 1 map. [12 refs.]

The Lloyd Barrage came into operation in 1932. Ever since 1927 systematic malaria surveys have been carried out in selected areas in Sind which were likely to be influenced by this large irrigation project. Since May 1928, 145,000 spleen examinations and 35,000 blood examinations have been made. An assessment of the effects of the barrage on malaria conditions is complicated by the fact that this part of India has been subject to severe regional epidemics of malaria at intervals of approximately 10 years, the last occurring in 1929. Moreover the rainfall, which is normally very scanty, is subject to large variation, in amount and distribution, from year to year. Parts of the Province where dry crops were grown had formerly little malaria ; on the other hand, rice growing tracts, villages on the banks of " dead " rivers, villages where extensive date palm cultivation is carried out, and a tract subject to annual flooding from the Indus, were highly malarious.

The barrage has produced a rise in subsoil water and has hindered the inflow of seepage water that formerly occurred in the winter ; it has

also led to an increase in rice cultivation, and the irrigation season in the old rice growing areas has been prolonged by several weeks. In places there is serious water-logging. These conditions, together with seepage from some of the new canals, have, in the opinion of the authors, aggravated the malaria problems of Sind. In many places there has been an increase in malaria incidence since the barrage came into operation. In areas which suffered from the regional malaria epidemic of 1929 there are villages in which the spleen rate, though lower than that observed immediately after the epidemic, is still very much higher than in the previous inter-epidemic period.

As regards the future much depends on the success of the Irrigation Department in providing efficient drainage. " Attention is drawn to the vital importance of making a soil and subsoil survey of the area involved, as well as providing an efficient scheme of drainage, before any large irrigation project is undertaken." *N. W.*

COVELL (G.) & BAILY (J. D.). **Further Observations on a Regional Epidemic of Malaria in Northern Sind.**—*Records of the Malaria Survey of India.* 1936. Sept. Vol. 6. No. 3. pp. 411–437. With 1 map & 19 graphs.

Regional fulminant epidemics of malaria occur every 10 years or so in Northern Sind where malaria is normally but little prevalent in inter-epidemic periods. The last such epidemic occurred in 1929 ; observations made in Shikarpur, before, during and after that epidemic were recorded by the authors in the *Records of the Malaria Survey of India,* Vol. 3, No. 2 (see this *Bulletin*, 1933, Vol. 30, p. 460). The present contribution is concerned with further observations made in Shikarpur and adjacent villages during the five years following the 1929 epidemic.

The spleen rates about eight months after the epidemic were of the order of 80 to 90 per cent., as compared with some 10 per cent. in the pre-epidemic period. The decline in the rates since then has not been so marked as experience in the Punjab, for example, entitled one to expect. In some places spleen rates have fallen to their former levels but in others rates of 50 per cent., or even higher, are still being recorded. Unusually heavy rainfall in 1932 and 1933 may be partly responsible for this, but the main cause relates to conditions arising out of the operation of the Lloyd Barrage (see above).

P. falciparum infections are most numerous and important : crescents are very rare immediately before the malaria season but become abundant at its height. *P. vivax* infections occur in some numbers at the commencement of the malaria season ; at its close the *vivax* parasite rate falls almost to zero. A number of benign tertian cases occur in the spring and early summer ; these are believed to be chiefly caused by infection acquired the previous autumn. The annual malaria season in this part of Sind is thus " in the main a mild replica of the great regional epidemics."

In conclusion the authors draw an interesting comparison between the Sind epidemic of 1929–30 and the Ceylon epidemic of 1934–35, about which there is already an extensive literature. They consider that the course of events in the two epidemics was very similar ; the precipitating cause in both cases was the sudden production of conditions favouring extensive propagation, longevity and activity of *A. culicifacies*

in the midst of a non-immune population. They do not consider that the first wave of morbidity, in either case, could conceivably have been an epidemic of relapses. *N. W.*

MOLONY (J. B. de W.) & GORMAN (J. H.). **Malaria in Quetta. An Analysis of the Statistics of Admissions to Military Hospitals, and their Correlation with Temperature, Humidity and Rainfall.**—*Records of the Malaria Survey of India.* 1936. June. Vol. 6. No. 2. pp. 273–288. With 2 graphs.

This is an interesting statistical analysis. The annual hospital admission rates for malaria among British troops in Quetta are not significantly correlated with the annual rainfall during the years 1888 to 1934. This may be due to a lack of correspondence between rainfall registered in Quetta and the rainfall on distant hills that is responsible for flooding in the Quetta plateau. Monthly malaria admissions from 1926 to 1934 among British and Indian troops are positively and significantly correlated with mean daily minimum and maximum temperatures; negatively and significantly with the relative humidity recorded in the mornings. There is no statistical evidence of effectual control of malaria in Quetta between 1888 and 1934. For some unexplained reason, however, the hospital admission rates for malaria between 1900 and 1913 were very appreciably lower than they were during the previous and subsequent periods. *N. W.*

MULLIGAN (H. W.) & BAILY (J. D.). **Malaria in Quetta, Baluchistan.**—*Records of the Malaria Survey of India.* 1936. June. Vol. 6. No. 2. pp. 289–385. With 2 charts, 1 diagram, 7 graphs, 1 folding map & 8 figs. on 3 plates. [37 refs.]

This is an admirable survey report. The survey which was carried out between July 25 and October 9, 1935, was preceded by a preliminary reconnaissance in May 1935, immediately prior to the disastrous earthquake. The large amount of information collected during two and a half months is indeed remarkable. The report should be of the greatest value to those responsible for the rebuilding of Quetta. It contains, moreover, facts of much general interest, and though survey reports of this nature are difficult, or impossible, to summarize, an endeavour will be made to direct attention to those features of the report that are likely to be of chief interest to the malariologist.

Quetta, the capital of Baluchistan, lies on a bare plateau between 5,000 and 6,000 feet above sea level. It is in the extreme west of British India. The night temperatures are always cool or cold: the mean temperature in summer is 78°F. and in winter 40°F. There is a large garrison. The population of Quetta at the time of the earthquake in May 1935 was estimated at 60,000. The population is largely a floating one; many visitors come from malarious districts but it is probable that Quetta exports as much, or more, malaria than is imported.

Quetta has had an unenviable reputation for malaria for many years but this is the first comprehensive malaria survey that has been carried out there.

The anopheline fauna of Quetta is rich and is of special interest as containing Mediterranean, Indian and Oriental species (according to the grouping of Christophers). It would appear to be close to the eastern limit of distribution of the Mediterranean species and to the

western limit of distribution of the Indian and Oriental species. The following species were captured :—Mediterranean : *A. superpictus*, *A. dthali*, *A. pulcherrimus*, *A. sergenti*, *A. multicolor*. Indian : *A. culicifacies*, *A. stephensi*, *A. turkhudi*, *A. fluviatilis*. Oriental : *A. lindesayi*, *A. subpictus* ; and a new species, *A. habibi*. Larvae of *A. moghulensis* were also found. A total of 14,072 anophelines was identified of which 7,049 were bred from larvae and pupae. The number of anopheline females dissected and examined for malaria infection was 3,044. Of the thirteen species found only five were in numbers sufficient to warrant any suspicion that they might play a part in the transmission of malaria, namely, *A. superpictus*, *A. culicifacies*, *A. stephensi*, *A. dthali* and *A. turkhudi*. Of these the first three were by far the most numerous and were the only species of which infected females were found. The relative potential danger of these three species to the community is determined by multiplying figures representing relative prevalence of wild-caught females by the percentage of infections as determined by dissection. Thus expressed the importance of these species as vectors of malaria in Quetta are *A. stephensi* 1, *A. culicifacies* 6·6 and *A. superpictus* 11·3. There is some evidence to suggest that had it not been for malaria control measures that were being undertaken in part of the area *A. stephensi* might have been a relatively more important vector than the above figures suggest.

Though *A. superpictus* has long been recognized as an important vector of malaria in Mediterranean countries and in the Near East, this is the first report of its playing a similar rôle in India, and, moreover a preponderating rôle. Of the total adult anophelines caught 53 per cent. were of this species, while of the 7,049 anophelines bred 45 per cent. were *A. superpictus*. Of the 1,412 *A. superpictus* females dissected 4·9 per cent. were found to be infected.

A. culicifacies formed 23 per cent. of the total adult catch and 21 per cent. of the bred specimens. Of the females examined 5·1 per cent. were infected. This species is generally recognized as being the most important vector in India as a whole.

A. stephensi, another dangerous Indian vector, especially in urban areas, formed 17 per cent. of the total adults caught and 17 per cent. of the bred specimens. Of the 719 females dissected 1 per cent. was found to be infected.

The close similarity of the figures representing the relative prevalence of these three species based on the number of adults captured and on the number bred from larvae and pupae, respectively, is remarkable.

Very full information is supplied regarding the breeding-places, the diurnal resting places and the dispersion of these three species, as well as summarized accounts of the rôle they play elsewhere as vectors of malaria.

The spleen rates among children in the neighbouring villages were, September 1935, round about 70 to 80 per cent. In Quetta City itself it was 31 per cent.

It appears that the transmission of malaria in Quetta is restricted to a very short period of the year, most infections occurring in July, August and September. The intensity of malaria varies very considerably in parts of the plateau at no great distance apart : this is admirably described and illustrated in a map. If due advantage be taken of this information in the rebuilding of Quetta this very important military station may be healthier in the future than it has been in the past.

N. W.

STRICKLAND (C.) & CHAUDHURI (H. P.). **More on Hill Malaria.**—*Indian Med. Gaz.* 1936. May. Vol. 71. No. 5. pp. 267-269.

The authors fed *A. stephensi* on malaria patients in Calcutta during the autumn malaria season. Some of these mosquitoes were kept in Calcutta where 58·5 per cent. showed infection, others were transported at once to the lower Himalayan hills where only 6 per cent. developed infections. They conclude that "at about the altitude of 2,500 to 4,000 feet in the hills there is practically no autumnal malaria . . . physical conditions debar infection in the mosquito. People can therefore go without mosquito nets with impunity at this season. The spring epidemic of malaria in the lower hills of the Himalayas is not to be considered as a manifestation of Autumn infection."

W. Fletcher.

VISWANATHAN (D. K.). **Epidemic Malaria in Madras Presidency.**—*Records of the Malaria Survey of India.* 1936. June. Vol. 6. No. 2. pp. 239–271. With 8 charts. [23 refs.]

Severe epidemic malaria of the kind that, from time to time, has afflicted the more northerly Punjab Province in India, has rarely been reported from the Madras Presidency. It is, indeed, often assumed that it does not occur there. Considerable interest attaches, therefore, to the record of outbreaks in the districts of Bellary, Anantapur, Kurnool, Cuddapah and in the coastal areas of Ganjam and Vizagapatam, with total annual mortality rates ranging from 39 to 49 per mille. The greater part of Viswanathan's report is devoted to a description of an epidemic of malaria that occurred in 1933–34 in parts of the Anantapur and Bellary districts. This was associated with two years of abnormally high rainfall. Both *P. vivax* and *P. falciparum* infections were observed—in about equal proportions at the height of the epidemic. *Anopheles culicifacies* appears to have been solely responsible for the spread of the disease. *A. subpictus* and *A. stephensi* were also found, in a limited mosquito survey. The highest monthly mortality rate recorded during the epidemic was 175 per mille. The peak of the mortality curve was bimodal even in the lower age groups of the population. This fact and other considerations lead the author to postulate either the presence of different strains of parasites with different antigenic properties, or an enhancement of virulence of strains by repeated passage through insect and human hosts, or more probably a combination of these two factors. *N. W.*

HACKETT (L. W.). **Biological Factors in Malaria Control.**—*Amer. Jl. Trop. Med.* 1936. May. Vol. 16. No. 3. pp. 341-352. [12 refs.]

This is an attractively written account of the disappearance of malaria following upon agrarian development, "species sanitation," changing races of *maculipennis*, and the like.

"The map of malaria in Europe has come to resemble in its broad lines the map of distribution of the dangerous races of the *maculipennis* group. But the natural disappearance of malaria over large areas has been due not only to the occurrence of a kind of anopheline which lives by preference on domestic animals, but also to a certain trend of events. There has been evolution in agriculture. The primitive method of

occasional sowings interrupted by long fallow periods during which the land is abandoned to natural pasturage still persists in unprogressive or scarcely populated regions, but beginning in north-western Europe there has been during the last century a rapid extension of the practice of crop rotation. Every two or three years the fields are planted to legumes for the enrichment of the soil. This would result in an excess of fodder crops unless the economic balance were restored by an increase in livestock. Thus animal husbandry develops as an economic necessity and stall feeding substitutes natural pasturage. There is no grazing land left, for instance, in north Italy. This produces optimum conditions for the zoophilic anopheles. In the rice growing district lying between Turin and Milan, which might boast, if it cared, the greatest anopheline production of all Italy if not of all Europe, malaria has quietly faded out as modern agricultural methods have been adopted. If this be so, and there is no reason to doubt it, it may be contended on excellent grounds that the most important step ever taken against malaria has been the introduction of rotation of crops, considering the extent and importance of the area already rendered malaria free in Europe by this agricultural transformation." *W. F.*

BISHOPP (F. C.) & SMITH (C. N.). **Mosquito Work throughout the World in 1934.**—*Proc. 22nd Ann. Meeting New Jersey Mosquito Extermination Assoc.* 1935. pp. 50–77. [Summary taken from *Public Health Engineering Abstracts.* Wash. 1936. Aug. 29. Vol. 16. Signed Claud BROWNING.]

This paper, given at each annual meeting of the New Jersey Mosquito Extermination Association, records the history of mosquito control throughout the world for the year 1934. The subjects of necrology, taxonomy, mosquito-borne diseases, hibernation, laboratory technique, natural enemies, and larvicides, are treated and the work of the past year is recorded. A résumé of the control work against pest mosquitoes in the United States and Canada is given, a separate report being made of the work done in each State. Some discussion of the use of relief labour is given, and it is pointed out that some projects such as soil erosion are being carried on without adequate regard for mosquito control. This paper contains valuable information, references and data.

QUARTERLY BULLETIN OF THE HEALTH ORGANISATION. LEAGUE OF NATIONS. Geneva. 1936. Mar. Vol. 5. No. 1. pp. 110–139. —**Malaria under African Conditions.** [Report of Committee on Malaria and Resolutions of Pan-African Health Conference, Johannesburg, Nov. 20–30, 1935, pp. 110–113.] ROSS (G. A. Park). **Insecticide as a Major Measure in Control of Malaria, being an Account of the Methods and Organisation put in Force in Natal and Zululand during the Past Six Years** [Annex I. pp. 114–133. With 1 map & 1 fig.]. DE MEILLON (B.). **The Control of Malaria in South Africa by Measures directed against the Adult Mosquitoes in Habitations** [Annex II. pp. 134–137]. DE BOER. **Malaria Control by Planting of Swamps** [Annex III. pp. 138–139].

This is mainly an account of the success of hut-spraying in Natal.

The Committee on Malaria considered that " malaria occupies one of the foremost places—if, indeed, not the foremost—among the infective

diseases of Africa as a cause of mortality and morbidity in the indigenous populations." They emphasized again and again, in their report, that economic improvement is an essential preliminary, and they record their opinion that, " without raising the economic status of the vast bulk of the population of Africa as a whole, there can be no hope of applying the results of research on a continental scale or of improving the position of great populations with regard to malaria as a disease."

The following resolutions were adopted by the Conference :—

" The Conference recommends :

" 1. That advance with regard to malaria is, in the first place, required along the following lines :

(*a*) The improvement of the economic status of the African ;
(*b*) The study of malaria as a disease ;
(*c*) The extension of research into the bionomics of the dangerous anophelines of Africa.

" 2. That, in view of the widespread nature of malaria infection and the part that tolerance to this condition must play in the lives of the indigenous populations under existing conditions, more intensive research be carried out in Africa on the following particular problems :

(*a*) Child mortality from malaria in indigenous communities ;
(*b*) The extent to which the working capacity of the indigenous adult population is interfered with by malaria ;
(*c*) The influence of malaria on racial increase ;
(*d*) The influence of occasional drug treatment on immunity and particularly the question whether there is any danger to a primitive community in such treatment ;
(*e*) The influence of malaria infection in conjunction with other infections on the mental development of African children ;
(*f*) The various strains of the malaria parasite in Africa and the action of various therapeutic substances on the various strains, and especially on the gametes of these strains.

" 3. That the apparent successful results in control of malaria obtained in certain areas by the destruction of adult anophelines with insecticidal sprays warrant a continuance of research.

" 4. That consideration be given to the possibility of holding from time to time advanced courses in Africa for the study of malaria and its prevention under African conditions.

" 5. That, while research along the lines suggested in the foregoing resolutions is an urgent matter, it must not be forgotten that, without raising the economic status of the vast bulk of the population of Africa as a whole, there can be no hope of applying successfully on a continental scale the results of research or of markedly improving the position of great populations with regard to malaria as a disease."

In the first Annex to this Report, Dr. G. A. Park Ross gives an account of " Insecticide as a Major Measure in Control of Malaria, being an Account of the Methods and Organisation put in force in Natal and Zululand during the Past Six Years." He describes the progress of the epidemic which invaded these countries in 1929 and overran almost the whole of them during the next three years. He writes that " Having failed by larvicides plus quinine treatment to get control of epidemic malaria, which began in 1929, we have, for the past three years, fought it by a campaign on the grand scale against the adult mosquito plus the other measures mentioned. . . . In uncivilised areas we have had to depend almost entirely on insecticide, which is at once cheap, easy to apply and attractive to native people. Our sugar industry is unanimous as to its efficacy and has made its use compulsory. Our towns have followed suit and regard it of the utmost service in dealing with slum areas."

The insecticide used was concentrated Pyagra (a pyrethrum compound) diluted 1 in 18 with paraffin. The cost, ready mixed, is about 2*s*. 9*d*. per gallon (4,543 cc.) and the amount required is 100 cc. per 1,000 cubic feet.

It must not be thought that the hut-spraying was an entirely simple matter, or that nothing else was done. Anyone wishing to adopt this method should read Dr. Park Ross's account of the establishment of local committees, and of the training of Zulu demonstrators and assistants who gained the confidence of their countrymen and instructed them in anti-malaria work and treatment. In the native reserves, "during the winter, extensive spotting is maintained to locate *A. gambiae* breeding places, and these are dealt with if at all possible." The hut-to-hut distribution of quinine had already proved a failure, but hundreds of quinine depots were established where quinine and instructions were issued free of charge to those who of their own free will applied for it. A short quinine treatment of 30 grains a day for one week proved more satisfactory than the long treatment which was formerly given. "The reduced dosage has been used for three years. Every native malaria assistant is in favour of it."

Dr. B. de Meillon reports in a second annex, that "Where breeding is very restricted or cost a minor consideration, anti-larval measures must and have proved to be very effective. In Natal and Zululand, however, there are vast tracts inhabited by a scattered population in which anti-larval work is very difficult, because of the high rainfall or much exposed water and where the cost of its thorough application is prohibitive." In two experiments carried out in a native reserve, he found that hut-spraying cost only about a third of anti-larval work and that it was more effective. It is made quite clear that "Measures directed against the Adult Mosquitoes in Habitations" are unlikely to be universally successful. Similar success is unlikely to be attained in countries where the important vectors are mosquitoes belonging to species such as *A. maculatus* and *A. minimus* which leave the house when they have fed. "*A. funestus* and *A. gambiae* are almost entirely house-frequenting insects . . . most infected insects are found indoors. . . . *A. funestus* remains indoors until its eggs are matured. *A. gambiae* probably does the same." *W. F.*

TOWNSEND (Eleanor Winthrop). **Leukocyte Counts in Malaria. Analysis of 100 Cases.**—*Southern Med. Jl.* 1936. Oct. Vol. 29. No. 10. pp. 1026–1029.

This study of the leucocyte counts in malaria is based on 100 consecutive cases of the infection admitted to the Roper Hospital, Charleston. BEREGOFF in a previous study of leucocyte counts in tropical diseases, which included 560 cases of malaria, noted that the percentage of non-segmented neutrophils was greater according to the degree of severity of the infection, that a progressive increase in the segmented type with increased total count is of good prognostic significance, and that patients dying in coma had low total leucocytes, low polymorphonuclear total and relative increase in non-segmented types.

Among the author's 100 cases, 16 had counts of 10,000 or more leucocytes per cmm. In three of these, causes other than malaria were present which might give rise to leucocytosis. Of the remaining 13, five were between 1 and 9 years of age, and eight were over 12 years. Four had benign tertian, six subtertian, two both these, one was not

determined. Two ended fatally, one was a coloured girl of 7 years, with 5 days' illness, no chills, but stuporous ; her white cell count was 29,800 with 75 per cent. polymorphonuclears, 20 per cent. lymphocytes and 5 per cent. mononuclears. The other was a boy of 12 years, also coloured, with daily chills, jaundice and vomiting. His total count was 12,200, with 58 and 42 per cent. polymorphonuclears and lymphocytes respectively.

Of the 84 without leucocytosis two died. One was a white man of 57 years, with 3,100 leucocytes per cmm., 71 per cent. polymorphonuclears. The other was a coloured boy of 12 years with subtertian malaria ; the total count was 4,900 and 63 per cent. polymorphonuclears.

The author did not observe any relationship between paroxysms and leucocyte counts. The conclusions are of rather a negative character, but the occurrence of leucocytosis in 13 out of 97 cases (13·4 per cent.) where malaria was the only ascertainable cause, whereas it was absent in 84 cases (86·6 per cent.) with a comparable range of temperature would warrant further study. The author adds : " The importance of such findings in relation to differential diagnosis is enhanced by the frequency of cases in which history and symptoms on admission suggested an acute surgical intra-abdominal lesion." *H. H. S.*

WANG (C. W.) & LEE (C. U.) **Malaria and Relapsing Fever following Blood Transfusion including the Report of a Case of Congenital Transmission of Relapsing Fever.**—*Chinese Med. Jl.* 1936. Mar. Vol. 50. No. 3. pp. 241–248.

Fifty-four cases of benign tertian malaria and 6 of relapsing fever have followed blood transfusions in the Peiping Union Medical College Hospital in the ten-year period 1925–35, during which 3,700 transfusions were performed. In one case a pregnant recipient was infected with relapsing fever and passed it on to her premature infant who died of it. Malaria parasites were found in only one of 18 donors incriminated. One donor gave blood to 10 people in 1925, and two became infected. He was not used again till 1933, when he infected 3 out of 10 inoculated with his blood. He admitted having had a malaria-like fever 20 years before. *W. F.*

ZELMANOVA (F.). Morphologie comparée des modifications des hématies parasitées par les plasmodiums du paludisme et les facteurs determinant la possibilité de décéler ces modifications dans les préparations colorées. [**Methods for demonstrating Alterations in Red Cells caused by Malaria Parasites.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 3. [In Russian pp. 401–404. French summary p. 404.]

The author describes the methods of staining blood-films with the object of demonstrating the various alterations undergone by the red-cells harbouring malaria parasites. The addition of Manson's methylene-blue solution to Giemsa's stain is recommended in order to increase the azur content and alkalinity of the latter. Schüffner's dots are brought out best with a mixture of 1 drop Giemsa + 1 drop Manson solution (1 : 20 dilution) per 1 cc. tap-water, staining 2 hours ; for Maurer's dots the same proportions of these stains are used, but Manson's solution is in a dilution of 1 : 5, and the staining lasts 1½ hours. The stippling is seen best at pH 7·8, using tap-water. *C. A. Hoare.*

TOPORKOV (T. M.). Sur la présence des hématozoaires du paludisme dans les organes pendant la période latente. [**The Localization of Malarial Parasites during the Latent Period of Infection.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 3. [In Russian pp. 405–410. French summary p. 411.]

In 178 cases with a present or past history of malaria the author made parallel examinations of smears from the peripheral blood and various internal organs, with the object of establishing the localization of the parasites during the latent period of the disease. The parasites were found in the blood of inner organs only when they were also present in the peripheral blood. It is concluded that they are not stored in these organs during the latent period ; moreover, it is shown that they are destroyed in the spleen. The absence of the parasites from the peripheral circulation between the attacks is attributed to an extreme diminution of their numbers, when the probability of encountering them in the thick drop is near zero. This contention is corroborated by successful infection of G.P.I. cases with malarial blood which failed to reveal any parasites in the thick drop. *C. A. Hoare.*

DE BUCK (A.). **Degenerated Cysts and Black Spores in Anopheles infected with Benign Tertian Malaria.**—*Proc. Acad. Sci. Amst.* 1936. Vol. 39. No. 4. pp. 559–563. With 9 figs. on 2 plates.

This is an interesting dissertation on the nature of degenerated cysts and black spores in infected anophelines. Reference is made to an unusual type of clear degenerated cyst with a large brown or yellow centre which in its turn may have a darker inner part. These cysts appear to develop normally until sporozoites are found in the glands. Some of these cysts exhibit a few small black spores adhering to the brown centre : these small black spores, the author thinks, may be a stage in the development of sporozoites into typical black spores, the well known sausage or banana-shaped bodies.

Black spores are stated to be as frequently seen on the salivary glands as on the stomach : they do not occur in the cells of the glands but only on the coelomic surface. The author is convinced that typical black spores are associated with sporozoites and are never found in uninfected anophelines. They are, moreover, not found before the cysts have reached maturity. *N. W.*

STRATMAN-THOMAS (W. K.) & BAKER (F. C.). *Anopheles barberi* **Coquillet, as a Vector of** *Plasmodium vivax* **Grassi and Feletti.**—*Amer. Jl. Hyg.* 1936. July. Vol. 24. No. 1. pp. 182–183.

This note records the successful transmission of *P. vivax* with an *A. barberi* reared from a larva collected in a tree hole near Ithaca, New York. *N. W.*

TRENSZ (F.). Courbes sérologiques chez des paludéens en traitement. [**Serological Curves in Malaria Patients under Treatment.**]—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 749–758.

Weekly serological examinations, over a long period of time, were made of 46 patients suffering from malaria and the results of these examinations were plotted as serological curves. The technique used was the author's modification of Henry's reaction, using soluble

melanin (see this *Bulletin*, 1935, Vol. 32, p. 790.). Vernes's photometer was used for the readings. The author endeavoured to determine the utility of such curves in diagnosis, prognosis and treatment. Are such curves of greater utility than isolated examinations? To what degree are such curves comparable to serological curves in syphilis? Should treatment be continued until the patient is "serologically cured" and thereby relapses prevented?

His patients can be classified in three groups. In the first the serological index, at first positive, becomes completely negative under treatment. These were for the most part primary infections with *Pl. falciparum*. In the second group the serological index at first responds to treatment but at a certain moment fails to do so and continues more or less as a horizontal line. These cases were mostly persons who had been long infected and were suffering from relapse or reinfection; many had enlarged spleens and livers with blood proteins unbalanced. In the third group the serological index fails to respond to treatment: some of these patients were suffering from acute malaria, with parasites in the blood, and failed to respond to treatment. Others were chronic cases and were apparently immune.

A certain correspondence between the degree of enlargement of the spleen and the serological index was noted:—

Size of Spleen.	No. of Patients.	Mean Serological Index
Normal	4	47
Palpable	4	62
1–4 fingers ...	13	101
Handsbreadth ...	8	182
2–4 hands ...	7	231

N. W.

LORANDO (N.) & SOTIRIADES (D.). **Immunity in Malaria. Therapeutic Results obtained from Subcutaneous Injection of Immunized Blood.**—*Jl. Trop. Med. & Hyg.* 1936. Sept. 1. Vol. 39. No. 17. pp. 197–204. With 8 figs. [14 refs.]

This paper contains a general discussion of the acquisition of immunity in malaria and interesting clinical notes of 23 cases of malaria in children treated with subcutaneous injections of maternal blood. Such injections were followed by a reduction in the size of the spleen, remarkably rapid in some cases, and a rapid fall in temperature. Three injections of immune blood, combined with small doses of quinine for from five to ten days, are sufficient to effect a clinical cure and to develop an immunity the duration of which, however, has not yet been determined. The authors believe that the antibodies in the immune blood have no direct effect on the parasites, but act through the macrophages of the reticulo-endothelial system. *N. W.*

DUNN (C. L.). **Some Observations on the Therapeutics of Malaria in Ceylon.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 233–244. [17 refs.]

This latest addition to the already considerable literature of the 1934–35 Ceylon malaria epidemic is confined solely to the treatment

of the disease. The report is based, for the most part, on the opinions of local medical officers with large experience. Controlled experiments are obviously difficult to carry out during an epidemic of such magnitude.

The main impression one gets from a perusal of the report is that quinine is still the most effective and convenient drug for the mass treatment of malaria. The course of treatment recommended locally is 22½ grains daily for seven days. For a very short course, a three days treatment of quinine 30 grains and plasmoquine 0·02 gram a day gives good results if the parasites exhibit no abnormal virulence. Atebrin is considered unsuitable for mass distribution. Combinations of atebrin and quinine, and atebrin and plasmoquine, were found to be more toxic in their effects than when given alone. *N. W.*

RAGIOT (Ch.) & MOREAU (P.). Paludisme, hématurie quinique, quinacrine. [**Quinacrine in Quinine-Haematuria.**]—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 496–500.

The authors describe a severe case of subtertian malaria in which haematuria occurred subsequent to the administration of two intramuscular injections of 1 gm. of quinine and 0·5 gm. of the same drug by the mouth. Injections of quinacrine (French atebrin) were then given instead of quinine, 0·2 gm. in the morning and 0·1 gm. in the evening for 4 days. The patient improved quickly, the haematuria stopped at once, the schizonts disappeared in 3 days, and treatment with quinine was then resumed without recurrence of the haematuria. Abundant schizonts were present in the blood during the occurrence of the haematuria, and the authors suggest that this may be a point of distinction between haematuria due to quinine and the haematuria of blackwater fever in which the parasites disappear from the blood.

W. F.

RAGIOT (Ch.). Paludisme pernicieux. Traitement par quinine et quinacrine.—*Rev. Méd. et Hyg. Trop.* 1936. Sept.–Oct. Vol. 28. No. 5. pp. 290–292.

SANDERS (J. P.). **Treatment of Malaria by the Short Course Method.**—*Southern Med. Jl.* 1936. July. Vol. 29. No. 7. pp. 746–751. [13 refs.]

In the author's experience quinidine is superior to all other drugs tried in short courses of treatment, both in controlling acute attacks of malaria and in preventing relapses. The course consists of 10 grains, night and morning, for two days and then 10 grains for three more nights, a total of 70 grains. *N. W.*

SICAULT (G.) & MESSERLIN (A.). Quelques données nouvelles sur les thérapeutiques stérilisantes du paludisme. La cure continue. [**Continued Treatment of Malaria Patients.**]—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 598–611.

The authors describe the treatment of several groups of patients in Morocco with different combinations and doses of quinine, quinacrine and praequine. They found that their standard treatment was most suitable for the attack and that when this was followed by a weekly

treatment there were very few relapses. For old cases of malaria in a condition of premunition it was unnecessary to administer the initial standard treatment, because the weekly dose kept them free from attacks. The standard treatment for ordinary cases was a course consisting of 0·3 gm. of quinacrine and 0·03 gm. of praequine daily for 5 days, followed by a continuous treatment of one dose weekly. In very severe cases the initial treatment consisted of the injection of 1·6 gm. of quinine daily for the first two days, followed by three days' treatment with quinacrine and praequine. *W. F.*

RAGIOT (Ch.) & MOREAU (P.). Essai thérapeutique d'une nouvelle formule à base d'alcaloïdes totaux suractivés du quinquina. [**A Therapeutic Trial of a New Combination of the More Active Alkaloids of Cinchona.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1936. Feb. Vol. 14. No. 2. pp. 199–205.

The authors followed the directions of the manufacturer and injected 1·0 cc. of the febrifuge daily. This contained 0·04 gm. (0·6 grains) of quinine and infinitesimal quantities of the other crystallizable alkaloids. As the authors remark, these doses were homoeopathic and proved too small to be of use. *W. F.*

SCHMUTTERMAYER (Franz). Ueber Injektionsneuritis insbesondere nach Chininiinjektionen. [**Injection Neuritis with Special Reference to Quinine Injections.**]—*Wien. Klin. Woch.* 1936. Sept. 25. Vol. 49. No. 39. pp. 1197–1199. [22 refs.]

Two cases of neuritis following quinine injections. In the first case an injection of quinine-urethane was given into the upper arm about the middle on the external surface, therefore close to the radial nerve. The patient asserted that during the injection she had a painful burning sensation and immediately afterwards was unable to move the hand. A definite radial paralysis developed and this continued in spite of treatment. The second case received 0·5 [? ·05] quinine-urethane intramuscularly into the gluteal region, the injection was given by a beginner and was introduced in proximity to the sciatic nerve. The next day the patient complained of pain in region of the injection and a dead feeling in the posterior part of the right thigh. Later signs and symptoms of sciatic neuritis developed. The author considers that quinine is a powerful protoplasmic poison with a special affinity for nerve tissue, so that when it is even in the neighbourhood of a nerve it can produce severe and frequently irreparable damage. Such cases may involve the practitioner in serious legal actions. Hence the importance in giving quinine injections to carry out the procedure strictly *secundum artem*, and, particularly, to avoid introducing the quinine in proximity to nerves. *E. D. W. Greig.*

DECOURT (Ph.), DUPOUX (R.), BELFORT & HENRY (Ch.). Expériences sur la prophylaxie collective du paludisme réalisées dans la région d'Oued Zerga (Tunisie) en 1935. [**Mass Prophylaxis of Malaria in Tunisia.**]—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 487–493.

Successful prophylaxis with 0·3 gm. quinacrine and 0·03 gm. of rhodoquine-praequine once a week.

These experiments were carried out in a highly malarious region in which the malaria was due almost entirely to subtertian infections. The authors were amazed at the rarity of gametocytes, both in subtertian and benign tertian cases. They did not find a single crescent in 1,187 cases examined. At a survey made during the healthy season, both the splenic and parasitic indices were over 70 per cent. in children. In adults the splenic index was 64 and the parasitic index 56. The carrier was *A. maculipennis.*

Nine different groups of people received nine different preliminary curative courses of treatment with quinacrine and rhodoquine-praequine, at the beginning of the malaria season, followed by treatment, once a week, with 0·3 gm. of quinacrine and 0·03 gm. of rhodoquine-praequine by the mouth. The results were very good and the malaria was controlled without antilarval work. Daily quinine prophylaxis proved a failure ; people would not take it. The authors consider that the preliminary curative course is useless. [See SICAULT & MESSERLIN, above]. *W. F.*

ROBERT (W. Pierre). **Malaria in Children.**—*Southern Med. Jl.* 1936. July. Vol. 29. No. 7. pp. 738–742.

Some interesting remarks on malaria from the point of view of the pediatrician. Attention is directed to the abnormal clinical symptoms occasioned by malaria in infants. Reference is also made to the frequent association of pyelitis with malaria, a condition which clears up quickly under appropriate specific malaria treatment. *N. W.*

CHOPRA (R. N.), GANGULY (S. K.) & ROY (A. C.). **Studies on the Action of Antimalarial Remedies on Monkey Malaria. The Relationship between the Concentration of Atebrin in the Circulating Blood and Parasite Count.**—*Indian Med. Gaz.* 1936. Aug. Vol. 71. No. 8. pp. 443–445.

This paper describes experiments carried out on eight monkeys, *Silenus rhesus*, infected with *Plasmodium knowlesi*. Atebrin was given either intravenously or intramuscularly. The concentration of the drug in the blood and the parasite count were determined half an hour, 2, 6, 24, 48 and 72 hours after the atebrin injection.

The highest concentration of the drug in the blood was observed within half an hour of its administration : it could not be detected in the blood 24 hours after its injection. The parasite count diminished *pari passu* with the fall in the concentration of the drug. The authors conclude that atebrin, unlike quinine, may have a direct lethal action on *P. knowlesi* : it has, however, an indirect action as well as it takes 24 hours to bring the infection under control. *N. W.*

CASSUTO (Nathan). Il sistema reticolo-istiocitario nella malaria delle scimmie con particolare riguardo ai fenomeni immunitari. [**The Reticulo-Endothelial System and Immunity in Monkey Malaria.**]—*Riv. di Malariologia.* Sez. I. 1936. Vol. 15. No. 4. pp. 240–257. With 12 figs. on 2 plates. [17 refs.] English summary.

" A series of researches with 5 monkeys infected with *P. knowlesi* are reported : 3 were infected in an acute and 2 in a chronic state ; one of the latter had a latent infection and, following splenectomy, the infection of the other suffered reactivation.

"A careful and systematic examination of the reticulo-endothelial system carried out immediately upon death has shown in the 3 first monkeys a decided amount of phagocytosis with partial blocking of the R.-E.S., due to pigment. In the other 2 monkeys, instead, the multiplication of the single elements of the R.-E.S. was slight.

"These facts endorse the hypothesis according to which the R.-E.S. is partly concerned in the defence of the organism against malaria and also in establishing a consequent immunity."

SERGENT (Et.). Un procédé simple de conservation des oeufs d'anophèles. [**A Simple Way of preserving Anopheles Eggs.**]—*Arch. Inst. Pasteur d'Algérie.* 1936. Mar. Vol. 14. No. 1. p. 23.

Spread out on a glass slide a drop of gum arabic containing 1 per cent. formalin. The eggs are arranged on the gum arabic by means of a pipette. Dry in a current of air, put on a second drop of gum and apply a cover-slip.

W. F.

ARCHIVES DE L'INSTITUT PASTEUR D'ALGÉRIE. 1936. Mar. Vol. 14. No. 1. p. 84. With 1 fig.—Technique pour le transport d'oeufs frais d'anophèles. [**The Transport of Fresh Anopheles Eggs by Post.**]

A strip of thick, dampened blotting-paper is put into a phial 7 centimetres high. The bottom of the strip rests on the bottom of the bottle; the top is fixed between the cork and the neck of the phial, so that it is immovable. One freshly fed female anopheles is put in the bottle, and the cork is luted with paraffin. The anopheles lays eggs during the journey through the post.

W. F.

ROZEBOOM (Lloyd E.). **The Rearing of *Anopheles albimanus* Wiedemann in the Laboratory.**—*Amer. Jl. Trop. Med.* 1936. July. Vol. 16. No. 4. pp. 471–478. [2 refs.]

A. albimanus, a Central American malaria-carrier of importance, has been dealt with so faithfully by the Department of Sanitation of The Panama Canal, that at the Gorgas Memorial Laboratory, Panama, it was found advisable to resort to a system of artificial breeding when a continuous supply of adults of this mosquito was required for experiment. The technique adopted by the author is of the simplest, and the outfit costs but little.

Newly hatched larvae are placed in enamelled basins, one foot in diameter by 3½ inches deep, or somewhat bigger, containing a dilute infusion of alfalfa hay. Such an infusion is best prepared in bulk, and removed and diluted as required; two months are needed as a minimum before it is ready for use, and its nutritive value to the larvae is enhanced by the daily addition to the liquid in the basins of a small quantity of fresh yeast, placed on a glass slide immersed just beneath the surface. In the climate of Panama, provided that the breeding basins are kept out-of-doors, protected from rain and exposed to the sun for two or three hours a day, no further regulation of temperature is necessary. Larval development requires slightly more than a week, and a basin of water should not be used much longer than a month. Pupae, to the number of 200 to 300, are collected daily or oftener, and placed in cups of clean water. The adults emerge into lamp globes, and are thence transferred to the breeding cage. Contrary

to certain races of *A. maculipennis*, *A. albimanus*, if shielded from wind and plentifully supplied with moisture, mates readily in captivity, and the author is able to keep his adults in a cage measuring 2 × 2 ×2 ft. Details of the construction of the latter are given. The necessary moisture is furnished by a wet towel and an unglazed drain pipe filled with damp sand ; the resultant evaporation keeps the internal temperature of the cage at between 80° and 86°F. For the reception of eggs the cage is provided with a dish (2½ ins. in depth) of tap water and a few cc. of well matured hay infusion ; cork floats are provided as resting places for the females. Each morning the dish is removed and replaced by another, and larvae on hatching are transferred to a breeding basin by means of a pipette. In the author's laboratory, from 400 to 600 young larvae are thus dealt with each day ; as in the case of other insects, overcrowding leads either to starvation and death, or to retarded development and stunting.

The males are fed in the usual manner on sugar-water or the juices of fresh fruit, while the females are given a daily meal of blood from a human arm. *E. E. Austen.*

DE BUCK (A.). **Some Results of Six Years' Mosquito Infection Work.**—*Amer. Jl. Hyg.* 1936. July. Vol. 24. No. 1. pp. 1–18.

An account of a simple technique for obtaining a constant supply of mosquitoes for malaria therapy and of the factors which influence the percentage of successful transmissions.

The author emphasizes the fact that in Holland, using wild caught mosquitoes during the winter and supplementing these by laboratory bred insects during the summer, an adequate supply of mosquitoes can be obtained throughout the year by very simple methods. An important practical point is that the mosquitoes can be maintained for weeks on a diet of sugar, before and after their infective feed, without the slightest unfavourable effect on the growth of oöcysts or the ripening of sporozoites. The two Dutch races of *A. maculipennis*, *atroparvus* and *messeae*, are equally susceptible to infection and no refractory individuals have been encountered. During the winter, however, *messeae* shows an apparent refractoriness due to the protracted digestion of the blood during hibernation. Striking differences in the infectivity of two strains of *P. vivax* are recorded. Of 85 patients inoculated by mosquito bite with the Dutch strain, 36 failed to develop malaria ; of 159 inoculated in the same manner with the Madagascar strain, only 9 failed. The failures are ascribed to protracted incubation, and degeneration of sporozoites in the mosquito. The oöcysts are killed in mosquitoes kept for long periods (January to March) at 8°–14°C.

V. B. Wigglesworth.

VOLLMER (Ortrud). Ueber *Anopheles maculipennis*-Dauerzucht und einige Zuchtversuche. [**Continuous Breeding of** *A. maculipennis*.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Aug. Vol. 40. No. 8. pp. 342–352. With 1 fig.

An account of methods used for maintaining a stock of *Anopheles maculipennis* race *atroparvus* for malaria therapy.

The larvae were kept in large bowls containing freshly cut sods of living grass in rain water. The adults were kept in roomy gauze cages and fed on a young pig. Freshly caught adults of the same race

were introduced from time to time to prevent any possible degeneration from inbreeding. Attempts to rear *A. maculipennis* race *messeae*, *A. elutus* and *A. bifurcatus* by the same methods were unsuccessful.

V. B. Wigglesworth.

SERGENT (Etienne). Note sur les oeufs d'anophèles d'eaux saumâtres du littoral algérien. [**Anopheles Eggs on Brackish Water in the Algerian Littoral.**]—*Arch. Inst. Pasteur d'Algérie.* 1936. June. Vol. 14. No. 2. pp. 109–118. With 19 figs. (15 on 7 plates.)

The scene of the studies here described was formed by the mouths of two small wadis, respectively communicating with the sea some twenty and twenty-five miles to the east of Algiers. By far the majority of the Anopheles here met with are *A. maculipennis* var. *labranchiae*, the larvae of which swarm in water containing from 6 to 9 grams of salt per litre, but disappear when the salt content per litre reaches 10 grams. With regard to eggs, so many intermediate types were found between those of vars. *labranchiae* and *sicaulti* as more or less to obliterate the right of the latter to a distinctive designation. Despite favourable conditions supplied by brackish water, *A. elutus* was not encountered, and, among more than 3,000 eggs, there was only one batch belonging to the var. *melanoon*. Photographs are given showing structural peculiarities of the eggs of *A. claviger* (*A. bifurcatus*, in 1934 and 1935 obtained only in October and November, and then but seldom), *A. m. labranchiae* and *A. m. melanoon*. It is interesting to note that what are here styled top-minnows ("gambouses"), but whose identity is not more precisely indicated, destroyers of Anopheles in both egg and larval stages, flourish in water salter than the sea (26 gm. of NaCl per litre). *E. E. A.*

SWELLENGREBEL (N. H.), DE BUCK (A.), KRAAN (M. H.) & VAN DER TORREN (G.). **Occurrence in Fresh and Brackish Water of the Larvae of "*A. maculipennis atroparvus*" and "*messeae*" in Some Coastal Provinces of the Netherlands.**—*Quarterly Bull. Health Organisation. League of Nations.* Geneva. 1936. June. Vol. 5. No. 2. pp. 280–294. With 3 diagrams & 2 maps.

Previous investigations by the authors had shown that *adults* of *A. m. atroparvus* were most numerous in the coastal provinces of the Netherlands, except in South Holland where *adults* of *A. m. messeae* outnumbered the others. Data, albeit incomplete, indicated that surface water in the non-malarious province of South Holland is much less saline than that in the other coastal provinces, whence the natural deduction follows that the larvae of *messeae* prefer fresh and those of *atroparvus* brackish water. In view of the fact that findings in Germany and elsewhere prove that *A. m. atroparvus* "is by no means confined to brackish water in its larval stage," it was considered advisable "to settle this point in the coastal area of the Netherlands." The region covered by the authors' studies, which were continued during three breeding seasons, amounted to some 2,850 square miles, and included 907 breeding places, in South and North Holland, the delta islands and an inland area. Since there was no certainty that eggs found on any particular water would eventually give rise to adults, identification had to be made from full-grown larvae, whereof no fewer than 24,260 were examined. The characters, duly tested as regards reliability,

used in determination are described, and the results are summarized by means of maps, table and diagram. While " Atroparvus larvae are not limited to brackish water (mesohaline water of the hydrobiologists, with a chlorine content of 1,000 milligrammes per litre or more)," and this race even breeds " in completely fresh water (chlorine content under 100 milligrammes)," " its larval density in fresh water is less than 2 per cent. of that in brackish water." On the other hand, " messeae's preference for water of a low salinity is not so well marked as atroparvus's preference for water of a high salinity." As regards " the occurrence of a decided majority of atroparvus larvae in perfectly fresh water along the eastern boundary of the inland area," it is suggested that " atroparvus larvae succeed in occupying breeding-places uncongenial to their needs, and in suppressing messeae, so long as they are supported by a vast majority of their own kind in the surrounding or adjacent breeding-area." *E. E. A.*

GEBERT (S.). **The Breeding of** *Anopheles costalis* **in Sea-Water, in Mauritius.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 255–257. With 2 figs.

The finding by the author of larvae of *A. gambiae* (*A. costalis*) in strongly brackish pools, wherein the insect breeds from year to year, led him to test their ability to exist in pure sea-water. When eighteen first instar larvae were removed to the laboratory from water containing 12·27 grams of NaCl per litre, and placed in sea-water of which the NaCl content was 24·55 grams per litre, six larvae died in the first five days, and four others three days later ; the remaining eight larvae developed normally, pupated in from eighteen to twenty days, and yielded perfect adults at the end of a pupal stage which lasted for four days. By this time, owing to evaporation, the water in the container had diminished by about one-half, and its NaCl content per litre was found to be 46·77 grams, *i.e.*, it was nearly twice as salt as ordinary sea-water. First instar larvae, from pools in which the NaCl content was respectively 3·21 and 4·36 grams per litre, when placed in the foregoing concentration, perished within three days. Eight eggs taken from the breeding-ground to the laboratory, and there placed in sea-water, after three days yielded seven larvae, of which four died before the second instar, while the remainder pupated in sixteen days, and eventually produced adults of normal size.

After pointing out the difficulties and disadvantages under which the experiments were conducted, including a twelve-mile transit from breeding-ground to laboratory, the author concludes that the results show that *A. gambiae* is little affected by changes of environment, and may possibly be able " to live not only in ordinary sea-water, but also, perhaps occasionally, in the more concentrated sea-water in saltpans." *E. E. A.*

DE MEILLON (Botha). **The Distribution of** *Anopheles gambiae* **and** *A. funestus* **in Natal.**—*Publications of South African Inst. Med. Res.* 1936. Apr. Vol. 7. No. 38. pp. 133–135. With 1 map.

Climatic conditions are suitable for *A. gambiae* and *A. funestus* throughout the province of Natal. In normal years, however, the distribution of *A. gambiae* is restricted by vegetation, which shades otherwise suitable breeding places, and by the mountainous and hilly

nature of the country which normally prevents the formation of suitable *gambiae* breeding pools. Prolonged drought, denuding the vegetation, followed by midsummer rains, might cause much increased *gambiae* breeding; this is thought to have occurred in 1931–32 and to have been a factor in the causation of the malaria epidemic of that year.

A. funestus has a very restricted distribution: the small streams are constantly flushed and the large rivers have sandy beds and banks with very little vegetation. Such conditions are unfavourable for *funestus*. *N. W.*

CATANEI (A.). Sur les gîtes à larves d'anophèles des lacs de Savoie. [**Anopheline Larvae and the Lake of Savoy.**]—*Arch. Inst. Pasteur d'Algérie.* 1936. Mar. Vol. 14. No. 1. pp. 18–22. With 6 figs. on 2 plates.

The author has searched the great lakes, such as the Lake of Geneva, L. Bourget, L. St. Andre, and L. Annecy and he has found them free from larvae; the action of the wind produces too much disturbance of the surface. In the smaller lakes too, Anopheles are scanty or absent. *A. maculipennis* and *A. bifurcatus*, are nevertheless widely distributed in the district, and their breeding places are small collections of water behind the banks of the lakes, behind the masonry walls of landing-places and the like. *W. F.*

WATSON (Robert B.). **Some Preliminary Observations on Airplane Dusting for Anopheles Larvae Control.**—*Southern Med. Jl.* 1936. Aug. Vol. 29. No. 8. pp. 862–867. With 5 figs.

When the General Joe Wheeler Dam in the Tennessee valley is closed in October the lake that will be formed will have a shoreline of 950 miles: many hundred acres of the lake will have a depth of water of less than three feet. It is possible that *Anopheles quadrimaculatus* may breed in abundance. In anticipation of such an eventuality experiments have been carried out with airplane dusting in conditions similar to those that are expected to arise. The dust used in the experiments was Paris green and powdered soapstone—11 to 12·5 per cent. of the former. Taking twenty particles of Paris green per square inch as the minimum effective concentration, the effective dust path, flying at 50 feet, was found to be 520 feet wide.

Tortuous shoreline dusting did not give results commensurate with the risks involved: this type of flying is very dangerous. The reduction in larvae varied between 13·7 and 62 per cent. Over a small spring-fed natural lake and swamp, however, the results were much more encouraging. Under poor conditions, with a wind velocity of ten miles an hour, a 94 per cent. reduction of larvae was obtained in the open lake, 98 per cent. reduction in densely vegetated swamp land and 79 per cent. reduction in the densely wooded area. The cost, using a 10 per cent. by volume Paris green dust, was 1·22 dollars per acre, as compared with 2·20 dollars for hand and boat dusting and 2·28 dollars for oiling. *N. W.*

SCHARFF (J. W.). **Filling Tree-Holes: an Anti-Mosquito Measure.**—*Malayan Med. Jl.* 1936. Mar. Vol. 11. No. 1. p. 58.

"Regular and systematic tree-hole filling has been one of the many factors in the almost complete abolition of mosquitoes in Penang."

The holes must be carefully cleaned out and all dead wood removed. When clean, a strong disinfectant, 25 per cent. Agrisol, is brushed on. The hole is then carefully filled with a mixture of coal-tar and granite chips of putty-like consistency (not hot). A coating of an asphalt preparation, known as Colas, is run over the top to make the stopping water-tight. *W. F.*

BOYD (Mark F.) & KITCHEN (S. F.). **Is the Acquired Homologous Immunity to *P. vivax* Equally Effective against Sporozoites and Trophozoites ?**—*Amer. Jl. Trop. Med.* 1936. May. Vol. 16. No. 3. pp. 317–322.

The experiments described indicate that the mechanism of the homologous immunity acquired on recovery from a *P. vivax* infection is operative against the trophozoite stage of the parasites, but not against sporozoites. It is acquired regardless of whether the attack is artificially induced (by introduced trophozoites) or naturally induced (by introduced sporozoites). In whichever way the primary attack is induced it does not appear that the immune mechanism is capable of dealing with subsequently introduced homologous sporozoites, as some at least of these cells survive to produce the trophozoites of a sub-clinical infection. *W. F.*

SPRUE.

AUGIER (A.) & AUGIER (P.). La sprue.—Congrès des Colites Plombières-les-Bains 1935. [**Sprue. Congress on Colitis held at Plombières-les-Bains, 1935.**]—18 pp. 1935. Compagnie des Thermes de Plombières-les-Bains (Vosges).

This is a Congress paper on Sprue sketching the symptomatology, views regarding the aetiology and the suggested modes of treatment since the beginning of the present century. It contains no fresh information. *H. H. S.*

TOULLEC. La sprue. [**Sprue.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1935. Nov. Vol. 13. No. 9. pp. 1247–1255. [13 refs.]

This is a general account of sprue, reviewing some of the theories as to its aetiology and including remarks on the chief indications for treatment, but the more modern methods of the last 3–4 years have not been included. *H. H. S.*

MAURITIUS, COLONY OF: ANNUAL REPORT ON THE MEDICAL AND HEALTH DEPARTMENT, 1ST JANUARY TO 31ST DECEMBER, 1934 [KIRK (J. Balfour), Director]. Appendix I. pp. 40–41.—**Sprue** [ADAMS (A. R. D.), Senior Pathologist].

The provisional diagnosis of a case of what was thought to be indigenous sprue, mentioned in the medical report for 1933, was subsequently confirmed. Yet another case has been observed in 1934. The patient was a local man, of Creole descent, with a history of 8 months' illness and presenting the typical signs of sprue and a drop in weight from 140 to 60 lbs. He improved steadily on a milk régime.

Another case is briefly referred to, but is not on all fours with the others, for the patient was a European, a ship's carpenter landed at Mauritius already suffering from the disease. *H. H. S.*

SNIJDERS (E. P.). Over een merkwaardig geval van tropische spruw.—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1936. June 30. Vol. 76. No. 26. pp. 1602–1618. With 2 figs.

REED (Alfred C.). **Sprue—a Clinical Summary.**—*Amer. Jl. Trop. Med.* 1936. Sept. Vol. 16. No. 5. pp. 499–526. [45 refs.]

This article is, in the opinion of the reviewer, one of the best general clinical summaries of sprue he has met with of late. Not only is the clinical aspect dealt with in detail, with 9 case records illustrating various points in the symptomatology and treatment, but the aetiological side is also discussed and the morbid anatomy (or the absence of any characteristic changes).

[In one important point our experience differs from that of the author, *viz.*, in his statement "Tetany is not at all common in sprue." On the contrary we have frequently seen it in chronic cases, and most cases of sprue are chronic, with a low blood calcium and, short of tetany, cramps in the calves and elsewhere are frequently complained of. The author continues: "Its association with deficient blood calcium led SCOTT to postulate his theory of parathyroid lesions but

FAIRLEY and others have found no lesions in the parathyroids in sprue." This error has crept into the literature and, as a noted professor has stated, " it takes ten years to get a fact into the literature, but if the statement is wrong it takes a lifetime to get it removed." Hence indulgence is asked for the following apologia. SCOTT postulated *functional* disturbance of the parathyroids, basing the theory on the fact that the giving of parathyroid in many cases brought about an almost immediate amelioration and that when the deficient action had received support for a time the gland would assume its proper functions again. Under such circumstances no lesion, none, that is, demonstrable by ordinary pathological procedure, would be seen, nor, according to SCOTT's view, is it to be expected. Rarely, if ever, is a functional disturbance demonstrable by pathological change. It may be, it is true, but it does not necessarily follow that: " It must therefore be assumed that insufficient absorption of calcium from the intestine is at fault." Sprue may exist with a total blood calcium little below normal, but its distribution, its metabolism, its regulation by the parathyroids may be at fault, their function being temporarily in abeyance. The " ionic " calcium is deficient, and the " coagulative " in relative excess, under such conditions, though the total is within normal limits, the symptoms of sprue may occur. (See this *Bulletin*, 1923, Vol. 20, p. 733; 1924, Vol. 21, p. 43; 361; 1925, Vol. 22, p. 32; 760; 761.)] The article is well documented. *H. H. S.*

MEIRA (João Alves). Considerações diagnosticas sobre um caso de esprú.—Reprinted from *Rev. Assoc. Paulista de Med.* 1936. July. Vol. 9. No. 1. With 4 charts. [65 refs.]

HANES (Frederic M.) & MCBRYDE (Angus). **Identity of Sprue, Nontropical Sprue and Celiac Disease.**—*Arch. Intern. Med.* 1936. July. Vol. 58. No. 1. pp. 1–16. With 3 figs. [29 refs.]

The discussion in this article, which is of the utmost interest to those who meet with cases of sprue in the tropics or at home, and also to those whose practice lies amongst children, is based on nine cases presenting the symptoms of sprue, the ages ranging between 27 months and 60 years. In a terminal note the authors state that they have since had under observation five more patients, one an adolescent of 17 years, the others adults. Brief notes are given of seven and fuller accounts of two. The symptoms, physical signs, and biochemical analyses were all typical, except that in no case, in spite of the low calcium content of the blood, is mention made of cramps or tetany. All showed low sugar curves, eight had marked steatorrhoea (the other's stools were not chemically analysed); the same number had macrocytic anaemia, and free HCl was found after histamine, and in all the response to liver extract was prompt and satisfactory.

The authors agree strongly with the opinions of THAYSEN that coeliac disease of children, ideopathic steatorrhoea of adults in temperate climates and sprue of the tropics are fundamentally identical. " Infantile sprue and adult sprue . . . bear the same relationship to each other as do cretinism and myxoedema." The osteoporosis of the child has its analogue in osteomalacia in the adult, and the low blood calcium and phosphorus, the type of anaemia, the aphthous stomatitis, xerophthalmia and nyctalopia are changes recognizably due to

avitaminosis [but xerophthalmia and night-blindness are not common in tropical sprue; at all events, the reviewer has never met with it. Moreover, it is not safe to lay too much stress on similarity or even identity of individual symptoms as indicative of a single cause]. The article is clear and well documented and should be read *in extenso* by all interested in this subject. *H. H. S.*

SNELL (Albert M.). **Clinical Observations on Nontropical Sprue.**—*Arch. Intern. Med.* 1936. May. Vol. 57. No. 5. pp. 837–856. With 3 charts. [34 refs.]

The author describes and comments upon ten cases of "non-tropical sprue" observed by him at the Mayo Clinic. Nine came from the North Central States; one from Texas. Two had been born in Northern Europe but had spent their adult life in the U.S.A. None gave any history of living in the tropics. The clinical features were typical: steatorrhoea, gastro-intestinal disturbance, loss of weight, defective metabolism of Ca and P, with, in some cases, tetany and osteoporosis, and anaemia with pallor. The disease had existed, or the symptoms had been present, on and off for periods ranging between 15 months and over 20 years. Some clinical details and the results of the biochemical examinations are given in tables. These are discussed in the text and are of the usual characters seen in this disease. It is stated that "the urinary excretion of calcium is low but the faecal excretion of calcium is increased" [but is it not more accurate to account for both these by defective absorption?] During the periods of improvement the author noted that the serum calcium values gradually increased [this fact and the value of it in prognosis was pointed out by the reviewer 12 years ago, see this *Bulletin*, 1924, Vol. 21, p. 361]. The questions of pathogenicity and treatment are briefly touched upon and discussed. Three of the patients, two women and one man, died; one of intercurrent respiratory disease, one with symptoms of an aplastic type of anaemia and one "died of a hemorrhagic disorder of unknown etiology suggesting acute leukemia," but in the table the blood findings given for this patient are total leucocytes only 5,600 per cmm. and red cells 7,790,000 [!]. *H. H. S.*

THAYSEN (Th. E. Hess). **Ten Cases of Idiopathic Steatorrhoea.**—Reprinted from *Quarterly Jl. Med.* 1935. Oct. N.S. Vol. 4. No. 16. pp. 359–395. With 5 figs. on 1 plate. [61 refs.]

The detailed account of the ten cases referred to in the title of this article is preceded by a soundly reasoned discussion of the relations between coeliac disease, non-tropical and tropical sprue. In his preliminary remarks the author notes that "the only means we possess of establishing the differential diagnosis between pancreatic and idiopathic steatorrhoea, in cases with a normal blood-sugar curve, is the estimation of the nitrogen excretion in the faeces, which is increased to a considerable degree in steatorrhoea of pancreatic origin." It is not generally known that in this latter condition we may find normal blood-sugar curves and upset of calcium metabolism with tetany.

A table gives the presence or absence of certain symptoms in the ten cases discussed, notably steatorrhoea, stomatitis, anaemia and the form

of it, the blood-sugar curve, basal metabolism per cent. and the pigmentation. Six were cases of non-tropical sprue, one of tropical sprue and three of coeliac disease. Professor Thaysen's main thesis is that the central clinical feature—the metabolic disturbances—are characterized by: (1) Abnormal excretion of fat in the faeces; (2) Normal or slightly increased excretion of nitrogen; (3) A flat blood-sugar chart; and (4) Increase in basal metabolism. As a result of his analyses he infers that the steatorrhoea is due to diminished fat absorption and not to excessive excretion of fat by the bowel. As regards nitrogen excretion, in tropical sprue this is about 3 gm. in 24 hours, in non-tropical it varies between less than 1 gm. to 2·9 or even 3·6 (recorded by HOLST, see this *Bulletin*, 1928, Vol. 25, p. 57), *i.e.*, normal or slightly raised. To maintain nitrogenous equilibrium, therefore, a relatively high intake is necessary. The flat blood-sugar "curve" need not be stressed; it was observed in all ten cases, and others have demonstrated it in coeliac disease. On the other hand it is not found in other types of fat-diarrhoea and its existence in coeliac disease and sprue, tropical and non-tropical alike, lends support to the author's view of their identity. There is little doubt that this is due to disturbance of blood-sugar regulation and not to diminished absorption, as shown by the effect of oral or intravenous administration of glucose. Those of the ten whose basal metabolism was about normal were in a fairly good state at the time of the test. One patient, during a bad period, had an increased rate of 125 per cent., but when he had improved, 9 months later, it was normal 103–4 per cent. Disordered calcium metabolism, with changes in phosphorus metabolism was found in all the groups, but, of course, as is well known, this condition occurs in conditions other than idiopathic steatorrhoea. "A daily intake of 2·5 gm. CaO does not always ensure a sufficient resorption in cases with marked steatorrhoea" and to effect this it is all important to give sufficient calcium, phosphorus and ergosterol.

Among 45 cases of non-tropical and 180 of tropical sprue, some 60–70 per cent. had hyperchromic anaemia. In coeliac disease the hypochromic type is commoner, but this, says Professor Thaysen, does not "signify any fundamental difference between coeliac disease and sprue, but rather the expression of a special reaction on the part of the juvenile organism . . . . The occurrence of hyperchromic anaemia in children is recognized to be extremely rare." The author has also shown previously that hyperchromic anaemia though untreated may pass into a hypochromic form in a good period and *vice versa*; it is thought that the former (hyperchromic) is due to deficient absorption of some "extrinsic factor", hence the alternation in good and bad periods. Pigmentation may resemble that of pellagra (but without keratosis) and is regarded as due to B-avitaminosis. Glossitis is as frequent in non-tropical as in tropical sprue.

The avitaminosis question is discussed. Since absorption of vitamin A depends on the fat content of the bowel, the infantilism accompanying coeliac disease may arise from deficiency of this vitamin; abnormal calcium metabolism is known to result from deficiency of D, and this symptom (see above) occurs in coeliac disease and in both tropical and non-tropical sprue. B-vitamin deficiency has already been mentioned. Lastly, the megacolon may be present in all three. The author suggests that the primary cause is atony from altered innervation—low blood pressure and lowered vagotonus—then stasis of faeces and further gaseous distension.

These are some of the many points discussed in the article ; for further details the original article must be consulted. *H. H. S.*

MOGENSEN (Erik). Tre Tilfaelde af idiopatisk Steatorré (Gee-Thaysens Sygdom). [**Three Cases of Idiopathic Steatorrhoea (Gee-Thaysen's Disease).**]—*Hospitalstidende.* 1936. Oct. 6. Vol. 79. No. 40. pp. 1032–1053. With 5 figs. [33 refs.]

The late T. E. HESS-THAYSEN applied the term idiopathic steatorrhoea to all three manifestations (coeliac disease, tropical and non-tropical sprue) of what he considered one and the same disease. His conclusions were embodied in the monograph he published in English in 1932 ; "Non-Tropical Sprue." [See this *Bulletin*, 1933, Vol. 30, p. 57]. His labours in this field and his success—disputed in England but acknowledged in other quarters—warrants, in the opinion of Mogensen, the employment of the term Gee-Thaysen's Disease as a synonym for idiopathic steatorrhoea.

One of Mogensen's cases was that of a married woman, aged 27, who had never been in the tropics, and who had been perfectly well throughout her childhood during which she had suffered from no intestinal complaint. Half way through pregnancy, her stools became frequent and light-coloured. Severe anaemia, pigmentation of the face and aphthous stomatitis developed. After a normal confinement and puerperium, typical idiopathic steatorrhoea developed, with a flat blood-sugar curve, meteorism, pigmentation and aphthous stomatitis. Great improvement was effected on a diet poor in fats and rich in vitamins. The second patient was a man, aged 74, whose steatorrhoea was complicated by a hyperchromic, megalocytic anaemia which dominated the clinical picture. Though he had been in the tropics 20 years earlier, the case should be regarded as one of non-tropical sprue. The third patient was a woman, aged 38, whose idiopathic steatorrhoea had begun when she was 8 years old. She had a low blood-sugar curve after both the intravenous and the oral administration of glucose—a point supporting Hess-Thaysen's observation that a low blood-sugar curve is not due to faulty absorption of glucose.

C. Lillingston.

BEINS (Ch. A. G.) & LOTTGERING (A. B.). Een geval van inheemsche spruw met huidafwijkingen. [**A Case of Non-Tropical Sprue with Skin Symptoms.**]—*Nederl. Tijdschr. v. Geneesk.* 1935. Dec. 14. Vol. 79. No. 50. pp. 5739–5743. With 2 figs. on 1 plate. [14 refs.] English summary (3 lines).

Such a case as the one described had to be distinguished from "coeliac disease," pancreatogenic fat diarrhoea and even from pellagra. The patient, who was 42 years of age, had suffered for two years from an eruption and itching. The eruption, which was not symmetrical and had not the localization of pellagra, had begun on the back of one knee and spread over arms, legs and buttocks. It was brownish red in colour and scaly. The faeces were not formed, stuck to the vessel, were of pulpy consistence, putty-coloured, somewhat frothy, had a strong acid smell and contained numerous fat crystals. A blood macrocytosis appeared to be present. Blood sugar and other

blood tests were made. The cholesterin content of the blood serum was 132 mgm. per cent. and the calcium content 11·5 mgm. per cent. Absence of tetany, and of the low calcium content which goes with it, were probably due to the fact that fat diarrhoea had not been present for very long. A skin eruption is not a common accompaniment of sprue, but enterogenic eruptions, cases of secondary pellagra (pellagroid), are being described in deficiency diseases and are attributed to chronic gastrointestinal disturbance. It was the result of treatment which gave conclusive support to the diagnosis. Treatment, besides being dietetic, included the use of marmite but consisted mainly of intramuscular-injections of liver extract. It was successful to the extent of causing the disappearance of the sprue symptoms and a great improvement in the skin condition. *W. F. Harvey.*

FULLERTON (Harold W.) & INNES (J. Alexander). **Case of Idiopathic Steatorrhoea with Multiple Nutritional Deficiencies.**—*Lancet.* 1936. Oct. 3. pp. 790–792. [10 refs.]

The authors place this case on record because, in addition to some of the signs of ideopathic steatorrhoea ("non-tropical sprue"), there were indications of vitamin and mineral deficiencies.

A woman, 29 years of age, had suffered for some two months from spasmodic movements of the muscles of the face, trunk and limbs, attacks lasting for about five hours. She had suffered from mild diarrhoea since early infancy, 2 or 3 motions daily, but for the last 6 months up to 10 a day. They were said to be loose and light in colour [but in spite of her being in hospital for this condition on three occasions for 5 and 4 weeks on the first two, no description of the stools is given, but analysis showed the ratio of neutral fats to fatty acids to be 1 : 2·5]. She had lost weight, 2 stone "during the previous few months" [it would seem that no more definite statement on this was obtained]. She was pale, thin and undergrown, showed on admission symptoms of tetany; serum calcium low, 7·1 mgm. per cent. the day before admission, 6 mgm. six days later, 9 mgm. after another fortnight. Erythrocytes about 3 million, Hb 65–67 per cent., complete achlorhydria by fractional gruel test-meal [no record is made of the giving of histamine]. She was discharged improved 5½ weeks after admission. Nearly two years later she was readmitted, having shown similar symptoms, and in two days ecchymoses appeared on arms and legs, purpuric eruption on the thighs, and a painful swelling [? haemarthrosis] of the right elbow, red cells 2,440,000, white 8,400 per cmm., Hb 52 per cent., platelets about normal, serum-calcium 5·2 mgm. per 100 cc. She was given liver and a blood transfusion, with some improvement. She left at her own request after 4 weeks in hospital, but less than a month later was readmitted with pain in the throat, hoarseness, sore tongue, swelling of legs, and a day or two later a cough without much expectoration. The blood condition was better; red cells 4,200,000, white 14,750 (3 days later 8,400), Hb 70 per cent. In spite of treatment with iron, campolon, marmite, calcium lactate, radiostoleum and orange juice, the patient died a week after admission.

The authors are of opinion that the patient had suffered from coeliac disease as a child and that the late symptoms are ascribable to deficiency, of vitamins B_2 and C, and perhaps A, B_1, D and E also, and of calcium, iron and the "anti-anaemic factor." *H. H. S.*

KONSTAM (Geoffrey) & GORDON (Hugh). **Idiopathic Steatorrhoea with Skin Lesions and Megalocytic Anaemia.**—*Proc. Roy. Soc. Med.* 1936. Apr. Vol. 29. No. 6. pp. 629–631 (Clinical Sect. pp. 23–25). With 1 coloured plate.

——. **Idiopathic Steatorrhoea with Osteoporosis, Tetany and Megalocytic Anaemia.**—*Ibid.* pp. 631–633 (Clinical Sect. pp. 25–27). With 2 figs.

These cases are referred to here because idiopathic steatorrhoea has by some authors been designated non-tropical sprue. In both there were some of the symptoms of sprue, reduction of serum calcium, a mild degree of anaemia of the macrocytic type ; in one there was diarrhoea with large pale stools, in the other constipation with occasional periods of diarrhoea, both were wasted and pale ; the stools showed excess of total fat and relative preponderance of free fatty acids. In the first patient there were patches of pigmentation on the chest, pigmentation with dryness and cracking of skin over the anterior aspect of both legs and pigmented patches with lichenification over the dorsum of each foot. There was a good deal of pruritus. Pellagra was suggested but the sites of the pigmentation differed from those affected in this disease. Neither patient had been in the tropics. Improvement followed the administration of calcium and vitamin D, but liver therapy was disappointing. *H. H. S.*

WEIR (James F.) & ADAMS (Mildred). **Idiopathic Steatorrhea. Metabolic Study of a Patient, with Reference to the Utilization of Nitrogen and Fat.**—*Arch. Intern. Med.* 1935. Dec. Vol. 56. No. 6. pp. 1109–1116.

The patient was a white man of 26 years with no history of having visited the tropics. He was undersized and according to his history he had grown little since the age of fifteen years. During the past 10 years he had had recurring attacks of anorexia, diarrhoea, flatulence and fatigue, with loss of weight. Four or five stools were passed daily, the first two or three bulky and grey, the others watery. The attack preceding his coming to hospital had begun five months before and he showed signs of subacute combined sclerosis—numbness and tingling in hands and feet and some inco-ordination. He was weak, pale, showed some oedema, clubbed fingers and a doughy distended abdomen. He had had a glossitis and stomatitis 2 years before. Blood examination showed Hb 10·3 gm. per 100 cc. (62 per cent.), red corpuscles 2,580,000, white 2,700 per cmm. The anaemia was of the macrocytic type, but though " the blood smear presented the picture of pernicious anaemia " there is no mention of any erythroblasts. Gastric analysis gave total acidity 38 and free HCl=22 cc. decinormal NaOH. Serum-calcium was down to 7·8 mgm. per cent., phosphorus 3·4 mgm.

Treatment by diet low in fat, high in protein, with calcium lactate 1 drachm three times a day, and viosterol and liver extract, resulted in disappearance of symptoms ; the weight increased, stools were normal, twice daily, no oedema. Blood had improved : Hb. 12·9 gm. (77 per cent.), red corpuscles 4,320,000, white 5,100 per cmm., some hypochromia but " not . . . the features of pernicious anaemia . . . previously present." Protocols show the intake of nitrogen, fat, etc., and the results of faecal analyses. It is seen that the patient had a

low tolerance for fat ; increase of intake increased the output and a low intake relieved the gastro-intestinal symptoms and reduced the number of stools. *H. H. S.*

LAWOETZ (B.) & VOGT-MØLLER (P.). Studier over Fedtstofskiftet. II. Fortsatte Undersøgelser over Haemolipokrit-Metodens Anvendelighed og over Hyperlipaemiens Fysiologi samt Pathologi ved forskellige Sygdomme, navnlig ved idiopatisk Steatorrhoe (Sprue, ikke-tropisk Sprue, intestinal Infantilisme). [**Studies of Fat Metabolism. II. Further Investigations of the Applicability of the Haemolipokrit Method, and of the Physiology of Hyperlipaemia and its Pathology in Various Diseases, Notably in Idiopathic Steatorrhoea (Sprue, Non-Tropical Sprue, Intestinal Infantilism).**]—*Hospitalstidende.* 1936. Oct. 6. Vol. 79. No. 40. pp. 1009–1031. With 1 chart. [27 refs.] German summary.

In an earlier publication appearing in 1934, the authors gave a detailed account of the haemolipokrit method, devised by Rückert, and they discussed its application to the determination of the lipoids in serum. Their present publication brings their studies in this field up to date, and deals with the exploitation of this method by the clinician. They have found that this method provides an easy and sure means of determining the fatty contents of the serum with the exception of free cholesterin. Though it is not yet clear whether the method can be so modified that it can be relied on to assure fractional determinations of the fatty contents of serum, it is assuredly a great advance on earlier methods, and it should do much to throw new light on the physiology and pathology of fat metabolism.

With regard to the possibility of the lipoids in the blood in the fasting state being kept within such uniform limits that a divergence thereform can be considered as pathological by a single test, the authors are sceptical, having found the range of variation too wide. The lipoid content of the serum of 10 patients suffering from idiopathic steatorrhoea was measured, and in the severe cases it was found far below the normal fasting limit. In the light forms of the disease, however, the lipoid content of the serum was low, but still within normal limits. It would seem from these and other investigations that the steatorrhoea of sprue is due to diminished fat resorption. The authors' investigations were also extended to cases of pancreatogen steatorrhoea, jaundice from mechanical causes, cirrhosis of the liver and chronic nephrosis. *C. Lillingston.*

LUDWIG (H.). Zur Pathogenese und Therapie der nichttropischen Spru. [**Pathogenesis and Treatment of Non-tropical Sprue.**]—*Schweiz. Med. Woch.* 1936. May 16. Vol. 66. No. 20. pp. 473–477. With 2 figs. [29 refs.]

The author describes two cases of the poorly-differentiated condition denominated non-tropical sprue. Both were males, one of 40 years, the other 48 years. The former had no soreness of the tongue but he presented symptoms of tetany, Trousseau's and Chvostek's signs positive, serum calcium 5·04 mgm. per cent., fatty stools, deficiency in gastric HCl, but no blood changes of any moment—red corpuscles 4·9 million, haemoglobin 95 per cent. Within 3 months he put on 7·5 kgm. and the serum Ca rose to 14·2 mgm. No details of the treatment of this patient are given, though there is the statement that

adrenal cortex extract was ineffectual. He was kept in bed, given a mixed diet with calcium Sandoz.

The second patient had more typical symptoms: sore tongue, wasting, osteoporosis, marked anaemia—red cells 1·28 million per cmm., haemoglobin 30 per cent., colour index 1·2, stools 4–6 in the early morning, serum calcium 7·2 mgm. per cent. He improved greatly from injections of campolon; in 7 weeks erythrocytes were 4·3 million and serum calcium 10·8. The results of the faecal analyses do not show much change; at the beginning of treatment neutral fats were 37·9 per cent. and free fatty acids 41·8 and 6 weeks later the figures were 37·4 and 51·4 per cent. respectively. [The title hardly describes the contents of this article; not much is said regarding treatment, and nothing on pathogenesis.] *H. H. S.*

DAHR (Peter) & HAGEMANN (Paul). Zur Bedeutung der Bakterien- und Pilzbefunde bei Sprue. Sammelbericht an Hand eines bakteriologisch untersuchten Falles einheimischer Sprue. [**The Significance of Bacteria and Moulds in Sprue.**]—*Giorn. di Batteriol. e Immunol.* 1936. Aug. Vol. 17. No. 2. 39 pp. [160 refs.]

A review of the literature which has been published and opinions which have been expressed during the past quarter of a century, with even earlier references, on the question of the part played by bacteria and moulds in the aetiology of sprue. It is interesting and useful to have these points brought together, but apart from this the information has no longer any but historical value. In the same connexion the authors record the case of a woman of 30 years who developed sprue-like symptoms in Cologne though she had never been outside Germany. They found a "yeast-like mould" in the stools, the saliva, scrapings from the tongue, in the duodenal secretion and in the vagina, but conclude that it was a fortuitous contamination, having no aetiological connexion with the condition, which they think "is very likely a form of avitaminosis." *H. H. S.*

SUAREZ (Ramon M.). **Hematological Studies in Sprue.**—*Bol. Asoc. Med. de Puerto Rico.* 1935. Oct. Vol. 27. No. 10. pp. 239–249. With 10 charts. [20 refs.]

Dr. Suarez, who has done much work on the haematology of sprue, here gives an analytical account of 25 typical cases from the haematological aspect. During a period of 8 weeks they were on a special sprue diet and for the first two weeks were receiving 10 cc. daily, or on alternate days, and of 2 cc. daily for six weeks, of a preparation of Lilly's, on which 1 cc. is equivalent to 5 gm. raw liver.

His technique is described. He extracted 5 cc. of blood by venepuncture into a bottle containing 10 mgm. potassium oxalate. Haemoglobin was determined by Sahli's method, in which 100 per cent. corresponds to 14·5 gm. In interpreting haematocrit results he took as normal for men 5 million red cells and 42 as the volume of packed cells, and for women 4·5 and 41 respectively, these figures being those obtained from a study of 50 adults, apparently in good health.

In his analysis of cases Dr. Suarez notes an almost constant increase in the volume of the packed red corpuscles from the beginning of treatment. Two of three which did not conform with this were suffering also from ankylostomiasis. In 21 there was a reticulocyte response of

over 7 per cent., *i.e.*, more than four-fifths responded with a reticulocytosis to parenteral administration of liver extract. It was interesting to find that the higher mean cell haemoglobin concentrations tended to fall and the low concentrations to rise as treatment progressed, so that the averages of Hb concentration at the beginning (30·8 per cent.) were almost the same as that at the end of the investigation (30·3).

Returning to the subject of reticulocyte response, the highest average response at the end of a week was 10·5 per cent.; it varied between 0 and 42. An increase of reticulocytes in the blood stream was observed usually 3–4 days after starting injections of liver extract, reaching a peak in 5–9 days, and becoming normal again in the third to fourth week. Mention is made of the fact that in sprue (unless the initial red cell count is under 1 or over 3 millions per cmm.) as in pernicious anaemia, in spite of a reticulocyte response there is no red cell increase observed during the first week of treatment, although there is increase in the volume of packed cells and steady rise in haemoglobin. The increase in packed cell volume is not due to leucocyte increase, and there must be, therefore, a relative diminution in plasma. The author suggests in explanation of the apparent anomaly, that the reticulocytes "are dissolved or haemolysed in the diluting fluid." In one case charted the reticulocyte response was nearly 65 per cent. following administration of Valentine's aqueous extract of liver by mouth. A similar case has been charted by FAIRLEY. Another patient showed no reticulocyte response to autolysed liver extract and a slight diminution in Hb content; red cells increased slightly, but without clinical improvement. Lastly, two patients showed a mean Hb concentration of 20 and 22 per cent. Maximal doses of iron and ammonium citrate were given, with the idea that there might be Fe deficiency; they did not, however, show any reticulocyte response, and both corpuscles and Hb slightly diminished. Intramuscular liver therapy led to a good response and the mean cell-haemoglobin concentration rose to 30 and 30·1 per cent. respectively during the period of observation.

H. H. S

FAIRLEY (N. Hamilton). **Prognosis of Tropical Sprue.**—*Lancet.* 1936. Apr. 18. pp. 911–912.

This is one of the excellent series of articles which have been published in the *Lancet* during the past year dealing with prognosis in different diseases. No better choice could have been made for writing on this vexed question than one who has himself suffered from the disease and has for some years made an intensive study of it from various aspects. The author starts by mentioning the views of investigators of sprue in Porto Rico that deficiency of the extrinsic factor in the diet is responsible and shows that to this there are several objections, *e.g.*, in India, Europeans with a diet containing ample sources of the extrinsic factor (red meat and eggs) acquire sprue, whereas Hindus and Moslems on a diet deficient in this factor, though they may develop macrocytic anaemia, do not suffer from sprue; the same may be observed in Africa. [Sir Seymour SHARKEY used to say that the accuracy and depth of a man's knowledge of medicine might be gauged by his prognosis, for a true prognosis implies accurate diagnosis, knowledge of the normal course of a disease, its probable and possible complications, and also its treatment.]

In sprue there is a natural tendency to remission and relapse, and death when it occurs, if not the result of intercurrent disease, is usually due to either asthenia and persisting diarrhoea accompanied or not by tetany ; to profound anaemia, or to ulceration and perforation. The most successful treatment on modern lines consists of rest, at first in bed ; of graded diets of high protein, low fat and carbohydrate, and adequate vitamin ; of liver extract *per os*, or parenterally, and calcium salts *per os*. Signs of progress to recovery are disappearance of abdominal distension and flatulence, cramps and tetany, diminution of stool in size and number and increase in body weight ; restoration of blood to normal ; decrease in faecal fat, increase of serum calcium, restoration to normal of the glucose-tolerance curve. Factors militating against recovery are age and complications (especially fever as indicative of intercurrent disease or intestinal ulceration, sprue being usually afebrile). Years may pass in perfect health when a relapse may suddenly occur, preceded in some cases by mental worry, diet indiscretion, chill. It is satisfactory, however, to know that in nearly all cases response to treatment is as satisfactory and often as prompt as in the first attack. The question of return to the tropics is always one of difficulty, but probably the criteria laid down by Dr. Fairley are the best guide at present, *viz.*, to allow those to go back who have shown no return of symptoms after 6 months on normal diet, whose haematological and biochemical findings are normal during the same period, who are suffering from no other disease and are not over 55 years of age.

H. H. S.

MILLER (D. K.) & RHOADS (C. P.). **The Effect of Liver Extract on the Small Intestine of Patients with Sprue.**—*Amer. Jl. Med. Sci.* 1936. Apr. Vol. 191. No. 4. pp. 453–456. With 4 figs. on 2 plates & 1 chart.

This is an interesting account of the action of liver extract in patients with sprue, comparing its effect with what is observed in pernicious anaemia. In some cases, after the blood condition has reached and is maintaining normal levels, if liver extract is not given at short intervals flatulence, cramps and diarrhoea are liable to return. Certain changes, mainly or entirely of a functional character, have been reported by the authors as occurring in the small intestine in sprue, such as abnormal motility, segmental variation in contour and calibre, etc. [see this *Bulletin*, 1936, Vol. 33, p. 64], and these might recur in spite of the general improved condition of the patient if the liver therapy was withheld for 1½–2 weeks.

A detailed clinical account of such a case, in a woman of 50 years, is given, who was followed up for some years during and after treatment for the active sprue, and the effect of the liver extract (Eli Lilly & Co.) on the functional activity of the small intestine was demonstrated. The authors have found that sprue or pellagra patients need much larger amounts of liver extract than do those suffering from pernicious anaemia ; further, since more, much more, extract is needed to prevent diarrhoea than to maintain the blood levels, it is suggested either that " different fractions of liver are operative in sprue and pellagra from those which are effective in pernicious anaemia, or that the therapeutic action of the same substance varies in the three disease states."

H. H. S.

STRANDEL (Birger). **Experiments to isolate the Antianemic Principle of the Liver. Clinical Part.**—*Acta Med. Scandinavica.* 1935. Supplement 71. 52 pp. With 45 figs. & 3 charts.

In October 1934 the author reported to the Swedish Society for Internal Medicine the results obtained from the use of a new liver preparation, Pernami. These results were surprisingly good. One patient, however, did not respond even to large doses, but when the preparation was used in a concentrated form excellent results were obtained ; this concentrated product was put on the market under the name Heptomin. During the past year further researches have been carried out, Per LALAND and Aage KLEM of Oslo undertaking the chemical part of the investigations and the author the clinical part. Numerous dried fractional products have been obtained and each of these has been tested clinically with a view to determining which of them was the active principle in the treatment of anaemia. Half a dozen or more extractives proved inactive, but a like number were tested singly and in combination and were found to give rise to a reticulocyte reaction 3–4 days after the first injection. Charts are given showing the effects of these. New fractions are being tried and auxiliary tests made to isolate the antianaemia principle of the liver. So far they have succeeded in extracting from 100 gm. of liver 0·0002 gm. of a dry substance of a potency that 0·002 gm. dissolved in water and administered intragluteally has proved highly active in combating pernicious anaemia. The research is not yet completed.

H. H. S.

REVIEWS AND NOTICES.

ROCKEFELLER FOUNDATION. INTERNATIONAL HEALTH DIVISION. **Annual Report 1935.**—286 pp. With 35 figs. (3 maps) on 18 plates. New York : 49 West 49th Street.

The Annual Report of the International Health Division of the Rockefeller Foundation contains an account of its major activities in public health, epidemiology and research problems during 1935, but more than this it summarizes work previously accomplished which has led to the year's developments, and thus presents an altogether admirable review of the subjects dealt with, notably yellow fever, malaria, ankylostomiasis, tuberculosis and yaws, dealing with both the field and the laboratory aspects.

The aim is not to engage in extensive control of any of these diseases, but in the first place to study particular problems with a view to the wider application of knowledge so gained and to do this in countries and places which seem to offer the best opportunities for such study. In the second place to initiate schemes, to set up demonstrations for the local governments to take over as soon as they are going concerns and their utility has been confirmed. Thirdly, to provide aid to training centres and fellowships for public health workers. These are only a few of the benefactions conferred.

We may pass on to note in more detail a few of these activities, and pride of place must be given to *yellow fever*. Since 1931 an investigation has been carried on to determine the geographical distribution of yellow fever immunity in man. The African survey has now been completed, by testing sera for protection of mice, the sera being collected and sent in sealed ampoules under refrigeration to New York. Thus has been shown that immunity is widely, though irregularly, distributed from the coast of Senegal for some 3,300 miles to the upper reaches of the white Nile in the Anglo-Egyptian Sudan, with the Sahara as the northern boundary ; on the south a line along the north of Angola running east to the southern part of the Belgian Congo. The western part of this, extending to Nigeria, has had several epidemics both on the coast and inland, and is still having them, in fact nearly all the historic outbreaks of yellow fever in Africa have occurred within this area. The eastern part has never been regarded as a yellow fever area, and many sera tested because of histories suggestive of the disease proved negative, and the heavily immunized areas seem to be continuously endemic rather than epidemic, unless the infection be with strains of virus different from the classic strain, and for this there is some laboratory evidence. In this area a zone of high prevalence of immunity among children and adults exists, and there is an exceptional opportunity for study by epidemiologists, pathologists, entomologists and zoologists for determining the symptomatology and pathology of the disease, the characteristics of the prevailing strain of virus, the oeconomics of the blood-sucking insect vectors, the possible animal hosts.

The survey of South America on similar lines, begun also in 1931, is coming to an end and has included all the Brazilian States and Paraguay, Bolivia, Chile, Peru, Ecuador, Colombia, Venezuela and the Guianas. No evidence has been found of the recent occurrence of missed outbreaks of the disease transmitted by *Aëdes aegypti* in these places, but it has come to light that infection persists in certain districts

of the Magdalena Valley where Aëdes is not found, although the river towns themselves with high *aegypti* index have not been affected in recent years. As the report states :—

" 1. Yellow fever has continued endemic in the, for many years, silent Amazon regions of Brazil, Bolivia, Peru and Columbia.

" 2. Yellow fever has not continued endemic in the Amazon Valley as the result of continued dissemination of its virus from the few larger centers of population, since the percentage of immunes in such large centers among the lower age groups is much less than that found outside of such centers.

" 3. Yellow fever has continued endemic in certain parts of the Amazon Valley in which the presence of *Aëdes aegypti* has not been demonstrated after careful search."

The epidemiology of this *jungle yellow fever* differs altogether from that of the urban type, the latter being characteristically a " house " disease attacking non-immunes indiscriminately, whereas the former occurs in or close to uncut forest or jungle, and infection is contracted away from houses. Jungle yellow fever was first observed in 1932 in the Valle do Chanaan, Espirito Santo, Brazil, among workers in the fields, and a year or more later at San Ramón, Bolivia. Here too was observed the first indication that the endemicity of yellow fever might depend on the reciprocal interchange of jungle and urban virus. In 1933, an outbreak of 37 cases, 12 fatal, occurred in the Magdalena Valley, Colombia, at Caparrapi among workers sent to prepare land for crops. So the matter grew and a large area was revealed to be infected in southern Goyaz, western Minas Geraes, down to the State of São Paulo, an area of many thousands of square kilometres. It might be inferred that jungle yellow fever is usually an accidental infection in man, secondary to an epizootic or enzootic, analogous to human plague and rat epizootics.

Important results of recent laboratory work have been :—

" 1. The demonstration that the yellow fever virus can be transmitted from monkey to monkey in the laboratory by mosquitoes of the genus *Haemagogus*, a widely distributed genus, certain species of which have been observed viciously attacking man in districts of jungle endemicity.

" 2. The transmission of the newly isolated jungle virus from monkey to monkey in the laboratory by the *Aëdes aegypti* mosquito, the most important urban vector of the disease.

" 3. The demonstration of naturally acquired immunity in monkeys of three different species caught especially for this study at three widely separated points in South America."

Malaria naturally occupies an important place in the Foundation's activities. Work has been carried on in Cuba, Porto Rico, Nicaragua, Salvador, Colombia, Greece, Albania, Italy, Bulgaria, Cyprus, Portugal, Spain, India and elsewhere ; surveys and control demonstrations, biological factors in control, the use of Paris green (an important feature of which is the new dustless method of spread by using a mixture of Paris green and kerosene, the latter not being utilized as a larvicide *per se* but merely as a vehicle for spreading and keeping afloat the Paris green), studies of anophelines, of malaria parasites and of their therapeutic use have all been taken up.

Hookworm campaigns continue to confer untold benefits in many parts of the world, but the story has been related so often that it needs no repetition now. We cannot do more than mention other subjects of investigation and research, *anaemia, sprue, amoebiasis, schistosomiasis, yaws* and its transmission, especially the possibility of

Hippelates pallipes as the vector, and finally *tuberculosis* in different countries. The report ends with a sketch of its general sanitation work and a table of the expenditure during the year. A wonderful record of work and world-wide benefaction. *H. H. S.*

NORMAN (Vincent) [M.D., M.R.C.P., London, F.R.C.S. Edin., D.P.H. Lond.]. **Essentials of Modern Medical Treatment.** With Foreword by S. Watson SMITH.—pp. xvi+200. 1936. London: Hutchinson's Scientific and Technical Publications, Paternoster House, E.C.4. [10*s.* 6*d.*]

In this book the author has undoubtedly summarized a great amount of information which will be a help to the busy practitioner, some of it such as cannot be readily found in the text books. Newer means and methods of treatment are included. Alternative remedies are suggested for many complaints, while the inclusion of what might be termed minor affections, such as "the common faint"—to use the author's own term—will make the book serviceable to the student. A useful index is appended.

A feature of the book is the number of proprietary drugs and preparations, with the names of the makers, mentioned. This is not uncommon in articles on tropical medicine but its appearance in a book on general medicine is an indication of the modern trend to prescribe these articles. In stating where certain of the less frequently required serums, antitoxins, etc., may be obtained the book will be useful for rapid reference.

The "conciseness" of the book is emphasized as a valuable feature. The text is telegraphic in style, and this in certain places not only leaves the reader in doubt but may involve serious risk from overdosage. Instances in point occur in the treatment outlined for taeniasis and ascariasis. Where large doses of vermifuges are to be given the amounts advised and the method of treatment in detail should be free from ambiguity.

It is perhaps owing to the effort at brevity that the author is not successful in his dealing with tropical complaints. Among the notable omissions are ankylostomiasis, the undulant fevers, infectious jaundice and leprosy. Bacillary dysentery is not regarded as a separate disease. Other tropical conditions such as Leishmanial sores, Calabar swellings, climatic bubo and certain skin diseases probably do not occur so often in the practice of the general practitioner as to warrant their inclusion.

Certain statements in the book call for comment. That "M.T. malaria is notoriously difficult to cure" is not borne out in practice. Benign tertian malaria is found to be much more persistent. "Atebrin is non toxic" can hardly be supported in view of the reports of cerebral excitement, mental and other symptoms which have followed its use in Malaya and Ceylon. Blackwater fever can occur in patients who are taking fair doses of quinine regularly, and even a small dose of quinine, given to a patient in the preblackwater stage has been seen to precipitate haemoglobinuria. No mention is made of the need to keep the urine alkaline, of the value of sterile glucose solution intravenously, and of the wonderful success of blood transfusion in the treatment of blackwater fever.

In SCOTT's treatment for sprue parathyroid extract is given with the calcium lactate, and fouadin should be included in the remedies for bilharziasis. Yatren does not "disappoint" in the treatment of

amoebic dysentery when combined with emetine bismuth iodide, as pointed out by MANSON-BAHR. "Carbazone," another substance useful in amoebiasis, should be carbarsone. The improved open operation, with Carrel-Dakin irrigation and drainage as advocated by KILNER, is still often necessary in amoebic abscess of the liver where repeated aspiration has failed, and is giving much better results.

In trypanosomiasis the danger of blindness following the exhibition of tryparsamide should be stated. Regarding epilepsy no reference is made to the need of differential diagnosis from cysticercosis in man as shown by MACARTHUR. Malarial therapy in general paralysis of the insane has proved its value but to give the patient 5 cc. of malarial blood intravenously as advised, instead of intramuscularly, involves the grave risk of incompatability.

The book is described as "a work of ready reference for both the man in active practice and for the student requiring rapid revision for his final examination. It will also be valuable to those working for the higher examinations in medicine." While undoubtedly the volume will be of use both to the practitioner and student the parts dealing with tropical diseases will need considerable revision before this claim—particularly in its latter half—can be substantiated. *W. E. Cooke.*

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